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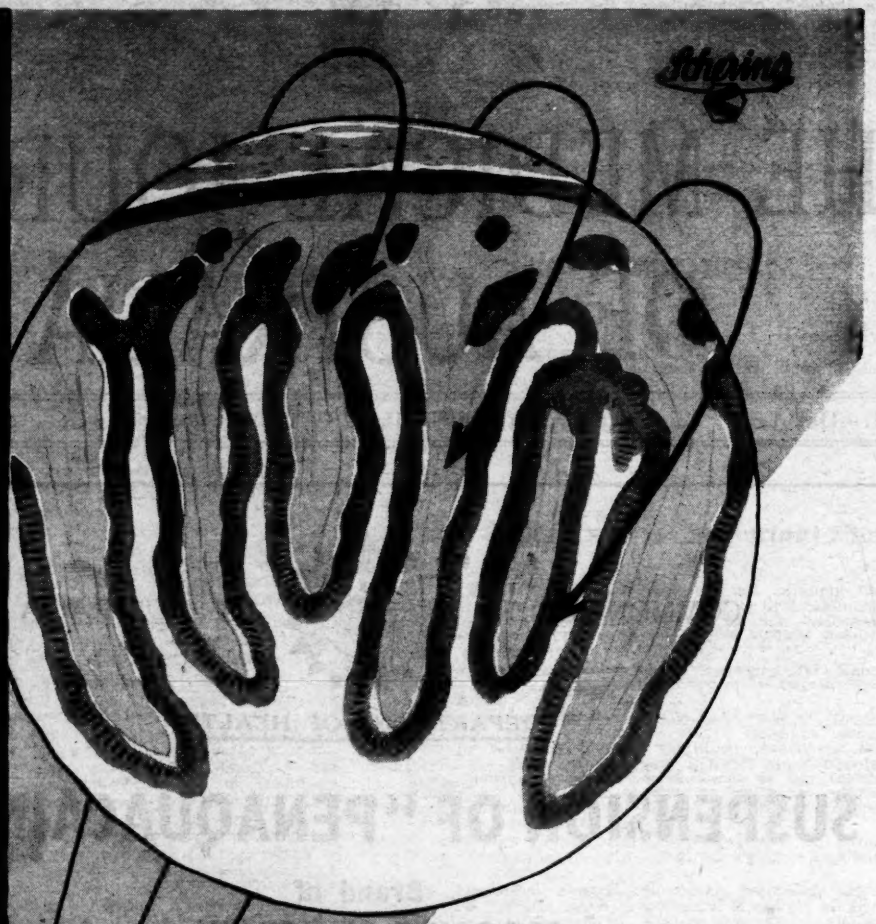

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An Address.[1]

THE FUTURE OF ANÆSTHESIA IN AUSTRALIA.

By MARY BURNELL,
Retiring President, Australian Society of Anæsthetists.

REFLECTIONS on the systems along which anæsthesia is organized in Great Britain and in the United States of America have prompted me to attempt some statement of the position in our own country, its advantages and its defects, and particularly its future, with the part that we should, in fact must, play in moulding it. I am convinced that the differences in our way of life, and in the organization of medicine here in Australia, are insufficiently appreciated abroad; and I have thought many times that some statement of our present practice and of our aims might be apposite at this most stimulating time in the history of anæsthesia.

In Australia, specialization in anæsthesia is a comparatively recent advance. With a few glowing individual exceptions, the subject did not develop as a specialty until about fifteen years ago. Its advance in the capital cities has been very rapid and has led to appreciation of the necessity for training opportunities in the basic sciences and in advanced anæsthetic methods. Provision for full post-graduate training is made in very few medical schools; courses and examinations are conducted in Sydney and Melbourne, while posts providing abundant post-graduate clinical opportunities exist in many of the big cities, although supervision and teaching in many of these are inadequate. At the same time some difficulty is experienced in filling such posts, and the supply of graduates with even limited anæsthetic experience and education who are available for hospital practice is on the whole not equal to the demand.

Private practice is almost entirely organized through individual reference and engagement by the surgeons themselves, sometimes, but not always, in recognition of services performed for them in an honorary capacity at public hospitals. The disadvantages are many, and include the difficulties of organizing working time to the best advantage, through the necessarily erratic nature of booking appointments, the comparative uncertainty of predicting duration of operations, and the common occurrence of cancellation and postponement, usually resulting in a gap which cannot be filled in any remunerative way. Our habit of transporting heavy machines and equipment, perhaps to several places during even one working day, is regarded with horror in other parts of the world. In the larger capital cities much time is lost in covering distances through traffic from one engagement to another. There is

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

no doubt that individual cooperation can ameliorate these conditions. Combination into groups does result in more efficient booking arrangements, less travelling from hospital to hospital, and economies in office expenses and perhaps in purchase of drugs. Properly organized group practice can also offer some insurance against the bugbear of the private anæsthetist, the loss of work and goodwill associated with illness and study or vacation leave. However, while private operative work in surgery continues to be practised on an itinerant basis, the anæsthetist must earn most of his living on an itinerant basis also.

A pleasing feature of recent years has been the increasing interest in special anæsthetic methods shown in some of the larger country towns, where it is usual now for at least one practitioner to try to better his skill in anæsthesia by various means; while in some large towns full-time specialist anæsthetists, who are able and successful, have become an indispensable part of surgical practice.

In many of the large public hospitals in the capital cities, even in the teaching hospitals, the special anæsthetic services are rendered entirely by honorary medical officers, whose function as teachers of undergraduates in basic methods is necessarily becoming subservient to the demands for more specialized techniques for "poor-risk" patients and massive operations. With all this, the demand for their services in public hospitals exceeds the ability of private practice to support them in their other hours. The conclusion seems inescapable that payments for service in public hospitals must become general soon, as it has done in a great many large public hospitals already.

In many of the large hospitals, for routine procedures and emergency operations which may be of considerable magnitude, resident medical officers, usually of very limited experience, are still employed; and it is comparatively unusual for the arrangements to include constant responsible supervision of their efforts by a full-time trained anæsthetist.

In all but a few medical schools, there seems no doubt that, for various reasons, undergraduate training in basic methods has deteriorated in recent years; it is interesting to learn from recent reading that this is acknowledged also to be the case in Great Britain, where on the whole the standard of anæsthetic services is so very high. There the opinion is increasingly held, apparently, that anæsthesia should constitute a post-graduate study; and the ideal of every single anæsthetic being administered by a trained, or at least a training, anæsthetist, seems near to achievement.

However, as I see it in Australia at present, and for many years to come, the ideal of trained-anæsthetist supervision of every single anæsthetic administration is absolutely precluded by our huge distances, our scattered country population, and the shortage of medical personnel. For successful anæsthetic practice two fundamental attractions are necessary: abundant and varied clinical opportunities, and sufficient financial reward. Only the larger country centres are likely to be able to offer these. Our general practitioners for many years to come must continue to administer anæsthetics in a large variety of operations and conditions. It follows, then, that they must be taught in their undergraduate days certain basic methods, and taught them well. It is often overlooked that such a practical training covers a wider field than that of the actual administration of anæsthetic drugs, giving the student instruction in the care of the unconscious patient, and in the resuscitation of those who are near to death from electrocution, drowning and other asphyxial accidents.

Once the undergraduate has been taught this, what then? We shall fail in our duty if we have not also taught him a healthy respect for his own limitations, and for those of the methods he has been taught. There is still a tendency, which does not apply to anæsthesia alone, for the graduate who has been trained for the safe conduct of a remote practice to impose on his patients his limited range of technique in situations where better methods are available.

The high standards achieved by Australian surgeons have called for, and been matched by, I think, an equivalent standard of skill among specialist anæsthetists. I saw nothing, when I was abroad, that was better than the best of Australian anæsthesia. Though much individual credit is due for this, particularly when one considers our isolation from world centres in medical thought, the rarity of visitors and lecturers in our specialty, and the disadvantages which accrue from delays in publication of new work abroad and in receipt of new drugs and appliances, it must be admitted that there is much anæsthesia, often called "special", of a mediocre standard. Here also, then, in the post-graduate field, efforts must be directed to education and improvement.

The exchange of information on clinical experiences and technical advances is a function of this Society, through the monthly newsletter, the State section meetings, and the annual general meetings. The proceedings of these last are to be reported in full in future in The Medical Journal of Australia, and should serve as authoritative statements on new advances in anæsthesia for the medical profession as a whole in this country.

In approaching the Royal Australasian College of Surgeons for the establishment of the Faculty of Anæsthetists, the Society has recognized its responsibility for initiating some uniformity in post-graduate courses and qualifications. These academic functions the Faculty will in the future perform.

Clinical opportunities must be arranged by establishing training posts in the larger and teaching hospitals. Such posts have little value without the direction of a full-time salaried and highly qualified anæsthetist. Departments of anæsthesia, in existence in many, must come in all the great public hospitals of this country. The benefits conferred on the specialty of anæsthesia and particularly on the hospitals themselves by such a policy are enormous.

The final thing to consider is that in which Australian anæsthesia is unquestionably lagging—research. Certainly we lack large financial resources; but the facilities we already own are considerable and could be extended. In other fields of medical research Australian brains have not been lacking. Surely all the many waiting problems in anæsthesia are not to be solved in other parts of the world.

SOME FURTHER ASPECTS OF THE USE OF RELAXANT DRUGS.[1]

By J. F. McCulloch,
Sydney.

With the increased use of muscle-relaxing agents there has developed a concept of anæsthesia as a triad—hypnosis, analgesia and muscle relaxation. To these three factors some would now add a fourth, apnœa, to form a tetrad (Gray and Rees, 1952). Wider experience of anæsthetic techniques of this type has introduced some questions to which there seems no immediate answer, and reflection on some of these has prompted the writing of this paper.

A combination of central nervous system depressants and myo-neural blocking agents permits the performance of prolonged surgical operations from which the patient often awakes rapidly and fairly completely. This awakening process, seen repeatedly over many years as a protracted and sometimes turbulent affair clouded by the fumes of ether, may be as swift as the induction of unconsciousness with an intravenously administered hypnotic. There is sometimes expressed the fear, not entirely groundless, that the patient may not wait for the end of the operation to wake up, but may be so paralysed as to be unable to indicate his terrible predicament. Of such a possibility Nosworthy (1953) writes: ". . . this calamity cannot take place unobserved without conditions of total curarization

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

and complete inexperience or inattention of the anæsthetist. Therefore, this contingency cannot be adduced alone as fair criticism of modern anæsthesia *per se*".

Sonnenschein recently (1954), discussing some of the effects of anæsthesia on the central nervous system, quotes the work of French, Verzeano and Magoun on the reticular formation of the brain stem. Spinal reflex activity was shown to be depressed or enhanced by stimulation of different areas, and sensation and consciousness were both affected by these integrating mechanisms. Stimulation in experimental animals was shown to be accompanied by electroencephalographic changes similar to those seen when a drowsing animal was awakened. Destruction of this area conversely was followed by the inability to stay awake. The induction and degree of unconsciousness may be understood quite easily with ether, for example; but why does a patient stay asleep for hour after hour on a mixture of nitrous oxide and more than adequate oxygen, with periodic injections of a muscle relaxant? Under what conditions does he wake up? These questions will be considered more fully later.

Relaxant drugs should be carefully chosen with a view to the degree and duration of their action, as well as the nature of the surgical procedure, and are commonly used under the following conditions:

1. For the passage of tracheal tubes or bronchoscopes.

2. For easy access to the abdominal cavity and its contents, with or without complete apnœa and the control of respiration.

3. For operations on the thoracic cavity. Here true control of respiration is important, first for the patient, and so that a static operation field may be provided intermittently for the surgeon, with inflation when required to indicate bronchial leaks or doubtful anatomical planes in such operations as segmental resection. Finally, spontaneous respiration should be resumed without undue delay when ventilation has stopped.

4. For manipulations. Manipulation of trunk or limbs often demands brief but profound relaxation, and "softening" of the contractions during electro-convulsive therapy is of course another similar indication.

5. For diminishing reflex response. There remains another method, rarely discussed but commonly used, in Sydney at least. This is the employment of myo-neural blocking agents in minimal dosage to obtain peripheral reflex suppression, when full relaxation is not necessary and not desired.

All anæsthetists must be aware of the difficulty of obtaining adequate light-plane anæsthesia for operations involving highly sensitive structures like skin, particularly skin on the extremities, as well as for dilatation of the anal and cervical canals. Third-plane anæsthesia with ether or cyclopropane is often necessary to quieten a healthy young adult for an operation such as the removal of plantar warts. A solution favoured by some anæsthetists is that of maximal relaxation in almost every case and the widespread use of "Prostigmin" to reverse the effect. One knows of intubation for vaginal plastic operations or those for the treatment of *hallux valgus*. Other than in exceptional cases, this seems both unwise and unnecessary. Thiopentone alone is, of course, notorious as the cause of the "moving target" about which surgeons are sometimes so mordant. It has been found, however, that discriminating use of relaxants in such cases permits a much lighter level of consciousness with quiet anæsthesia.

In the not-far-distant past, eminent colleagues have fulminated against this unheard-of practice. "Relaxing agents are for relaxation", they have said in effect, "not for the removal of warts." Nosworthy recently pointed out what is after all perfectly obvious, that the sequence of muscular paralysis beginning with the eyelids and ending with the diaphragm is exactly the same with the relaxants as it is with ether. Why then, if it is proper to carry muscular quiescence only to the required level with ether, is it improper to make myo-neural blocking agents do the same thing? After all, by graded minimal intravenous injections, it is with practice possible to produce quiescence in the limb muscles, but to spare the intercostals. That such precision is always possible is of course not true, and one sometimes overshoots the mark, with resultant temporary respiratory depression. With oxygen running into a pharyngeal airway, however, a good colour can be maintained until the tidal volume is increased. Cyanosis is indefensible and the means of pulmonary inflation should always be at hand, though it may be rarely necessary.

There is still the risk of carbon dioxide retention, which cannot be denied; but it must occur for short periods only if care is used, and ill effects in such cases are rare.

A common practice in this city, and one which has been subjected to criticism, is the mixing of a suitable relaxant with thiopentone in the same syringe and using the mixture as a single anæsthetic agent. The relaxant used must of course be one which is easily miscible with thiopentone. It has been found that 80 to 100 milligrammes of "Flaxedil", or five milligrammes of "Eulissin", mixed with 0·75 gramme of thiopentone are usually more than sufficient for the cure of an average inguinal hernia, for an appendicectomy, and for operations of similar duration. A dose of 1·1 grammes of thiopentone with eight milligrammes of "Eulissin" (an unusually large dose) reinforced by 100 milligrammes of pethidine was used recently for a bilateral foot operation involving tourniquets and four incisions. The operation lasted seventy-five minutes; the patient was awake and cheerful twenty minutes later. The surgeon was pleased. This form of anæsthesia, while perhaps not ideal theoretically, works well in practice in selected cases, and has the great virtue of eliminating the necessity for heavy equipment.

It will be noted that the relaxants mentioned differ in pharmacological character, "Flaxedil", like "Tubarine" and "Laudolissin", acting by competitive block, while "Eulissin" is a depolarizer. No clinical difference is noted between the two types of drug, and graded doses of either seem to achieve similar results.

Anæsthetists have been struck by the fact that less thiopentone is necessary to maintain anæsthesia when respiration is controlled than when it is assisted or spontaneous (Gray and Rees, 1952). Mutual potentiation by thiopentone and "Tubarine" was first suggested as a cause, but Gray and others seem to have shown this to be untrue. That anæsthesia may be maintained for many hours with "Tubarine" or "Laudolissin" and nitrous oxide and oxygen alone after intubation with 0·5 gramme of thiopentone and five milligrammes of "Eulissin" is well established in thoracic surgery, in which control of respiration is complete throughout. Injection of a small dose of relaxant when a patient is showing signs of returning reflex activity, particularly if assisted by moderate over-ventilation, frequently restores complete quiescence, and it is this experience which presumably gave rise to the early speculation that "Tubarine" had some anæsthetic effect of its own. Repeated investigations with conscious human volunteers have long since disproved this with "Tubarine" and every relaxant introduced more recently.

What, then, is the relationship between apnœa, unconsciousness and muscle relaxation? I describe briefly three cases which may shed some light on what is for me a fascinatingly complex subject. The first two may be bracketed together.

The patients were operated on on the same day, they were both females almost of the same age, both underwent left lower lobectomy in the treatment of tuberculosis, and both were in good condition and sputum-free. Intubation in both cases was carried out with 0·4 gramme of thiopentone and five milligrammes of "Eulissin", and both patients were placed in the right lateral position. Both were given 30 milligrammes of "Laudolissin" as soon as spontaneous respiration was fairly evident, fifteen minutes after the initial injection in one case, thirty minutes later in the other. Anæsthesia was maintained with nitrous oxide and oxygen, 500 millilitres per minute with each, until the completion of the operation, slightly over an hour later. Control of respiration was abandoned in each case when the chest had been made air-tight, and spontaneous respiration appeared shortly afterwards.

In the one case this was soon quite adequate, and by the time the dressings were in place the patient was resenting the tube. She woke up and answered her name when this was removed. She had no sign of tracheal tug, good intercostal movement and good tone of jaw muscles. No "Prostigmin" was given.

The second patient behaved in almost the same fashion, though spontaneous respiration was not quite so satisfactory, but was thought to warrant the removal of the tube. This produced no reflex resentment and no sign of returning consciousness. There was no tracheal tug, and oxygenation in atmospheric air was adequate, but the absence of jaw tone seemed to indicate the need for "Prostigmin", which was given, after the usual dose of atropine. Within two minutes tidal volume and jaw tone had returned to normal and the patient woke up.

The third case was one in which much the same routine was followed with "Laudolissin" as the relaxing agent, but in spite of an adequate dose of "Prostigmin" muscle paralysis persisted and the patient woke up still able to use only her diaphragm. Tracheal tugging, intercostal recession and paradoxical breathing were well marked, and passive ventilation for an hour was necessary. She gave the surgeon a graphic description the following day of the discomfort she felt at not being able to breathe properly.

It has been suggested that the effect of thiopentone is potentiated, not by the use of relaxants, but by the reduction of carbon dioxide consequent upon passive overventilation, and that it is greater with a high than with a low blood pH. Brodie and others (1950), in some elaborate animal experiments, were able to show considerable decrease in the serum thiopentone content when the pH was reduced by making the dogs breathe higher concentrations of carbon dioxide, an increase being evident when the latter was removed. They were unable to show any effect by raising the pH by the injection of sodium bicarbonate. These experiments, however, are not likely to be duplicated clinically, and may have no bearing on the problem. Dundee (1950) claims to have shown that the dose of thiopentone is less when respiration is controlled with a relaxant, in his case "Tubarine". This can surely have no bearing on the return of consciousness, however, when the total dosage of thiopentone has been 0·5 gramme given two, three or four hours previously, with nothing subsequently more potent than nitrous oxide and oxygen. In many cases apnœa seems a common factor, and when this is abolished, either by return of spontaneous breathing or by the use of "Prostigmin", consciousness returns.

Apnœa in this connexion is generally stated to be due to a balanced combination of three factors: (*a*) Reduction of carbon dioxide by over-ventilation, the threshold of the respiratory centre being thus raised. (*b*) Depression of the centre by premedication and anæsthetic agents. (*c*) Muscular relaxation—involving reflex suppression—permitting easy ventilation.

There remains a fourth factor not commonly stressed, and that is the inhibiting effect of the Hering-Breuer reflex. It is well known that this reflex alters the tone of muscles of respiration, which are more relaxed during inspiration than expiration, and it seems possible that this may be a contributory factor in the maintenance both of apnœa and of muscular relaxation. It was possible recently, one hour after the injection of 30 milligrammes of "Laudolissin", to eliminate repeatedly spontaneous respiratory efforts by gentle ventilation with 50% nitrous oxide and oxygen completely unsupplemented. Fifteen minutes after control was stopped the patient was breathing normally without "Prostigmin" and was awake. At this stage no sedative or relaxant had been given for over three hours, so one must assume that unconsciousness was maintained by nitrous oxide and oxygen supplemented in some way by low carbon dioxide levels, and/or lung inflation.

In three of the cases mentioned the conditions of returning consciousness differed. In one it occurred, as is most usual, when spontaneous respiration had been established at the end of the operation; in another—a not unusual pattern—it occurred only after relaxation had been abolished by "Prostigmin". In the third case, fortunately very rare, it occurred in spite of apnœa and the continued presence of muscular relaxation.

There seems to be no common factor governing the behaviour of these three patients. Perhaps the secret will be revealed by increasing use of the electroencephalograph. Who knows?

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ELECTROENCEPHALOGRAPHIC STUDIES OF THE CURARIZED PATIENT.[1]

By L. T. SHEA, G. M. DAVIDSON and J. DAVIS.

From the Department of Anæsthesia, Sydney Hospital, Sydney.

THE full pharmacological range of the state of anæsthesia may be represented as follows: (i) consciousness retained; (ii) consciousness lost; (iii) analgesia: (*a*) without relaxation, (*b*) with relaxation; (iv) medullary failure: (*a*) respiratory failure, (*b*) cardio-vascular failure. The "classical" anæsthetic agents such as chloroform and ether can account for the whole of this range unaided, while the more "modern" agents, such as thiopentone and pethidine, have a relatively restricted range. This restriction virtually limits their safe use to loss of consciousness *plus* analgesia but without relaxation. Further, the stage of medullary failure is, as it were, telescoped into the stage of relaxation. The same effect is seen to a lesser degree with cyclopropane (Human, 1947).

Hence we may speak of anæsthetic agents as being weak or strong. The strong agents can be used alone and exclusively, but the weak can be safe and satisfactory only if used within their range. The advantages of the weak agents can be had, while many of the disadvantages of the strong are avoided, if the weak are judiciously combined with the strong according to the circumstances (Shea, 1953).

The introduction of the relaxant group of drugs into this classical type of anæsthesia must result in profound changes in technical anæsthesia. For our purpose the relaxants produce relaxation with little or nothing in the way of other effects (Feitelberg and Pick, 1942; Pick and Unna, 1945; Whitacre and Fisher, 1945; Griffith, 1945; Kellgren, McGowan and Hood, 1946; Annotation, 1950). In one of our experiments 70 milligrammes of "Tubarine" administered over a period of forty-five minutes produced in the subject (G.M.D.) practically complete muscular relaxation without loss of consciousness or blunting of perception or sensation. The electroencephalographic tracing indicated that he was "awake" throughout.

Broadly, then, the change in plan brought about by the relaxants involves the use of either weak or strong agents to produce loss of consciousness and analgesia, any necessary relaxation being provided by one of the relaxants. With this set up it is possible for the analgesia to disappear and for consciousness to return while the patient remains relaxed enough to prevent him from complaining. This was in fact the state of our subject in the foregoing experiment. He gave no sign that he was conscious, yet he could see if his eyes were opened for him, and he could move his toes perceptibly in response to a command. The fear that this can occur on the operating table dogs many anæsthetists in their daily practice. We are aware of three

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

such incidents which have occurred in Sydney during the last five years. The accuracy of the patients' evidence leaves little doubt that they were aware of their surroundings. However, only one of the three made any reference to feeling pain.

The introduction of the relaxants has reemphasized the importance of the recovery period. It seems that accidental death during the recovery period is more likely after a relaxant than after a non-relaxant anæsthetic, at least in the hands of resident medical officers. Yet the relaxants are alone among all the drugs used by the anæsthetist, in that their effects can be allowed to terminate before the actual point of conclusion of the operation.

It follows from the above that two broad categorical plans are available for an anæsthetic technique in which the relaxants are used to produce relaxation. The first of these involves the use of a strong agent, commonly ether, to produce anæsthesia without relaxation (first plane surgical or less), any required degree of relaxation being obtained by small clinically divided doses of "Tubarine" or "Laudolissin", both of which synergize with ether. If

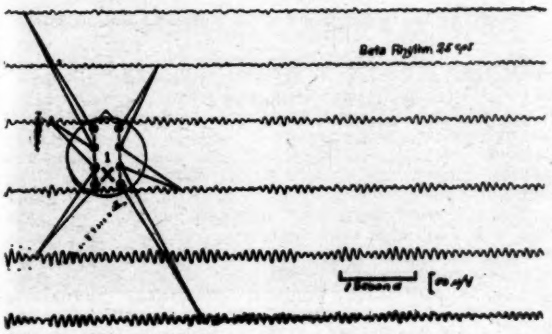

FIGURE I.
Normal electroencephalogram showing derivation of leads.

properly managed such a sequence is highly satisfactory and seldom needs "Prostigmin". Recovery of consciousness from the light ether anæsthesia should occur within a few minutes of the conclusion of the operation. The electroencephalographic record is characteristic of light ether anæsthesia (Courtin, Bickford and Faulconer, 1950; Bickford, 1950).

The second plan follows naturally from the ether sequence, in that the weak agents (thiopentone, nitrous oxide, pethidine) in various combinations can satisfactorily produce the required depth of anæsthesia if relaxation is to be taken care of by one of the relaxants (Rees and Gray, 1952). We have as yet no actual electroencephalographic records taken under this technique.

In the first plan, in which ether is used, the ordinary eye signs, both pupillary and eyeball, are available throughout the anæsthetic as an indication of the depth of ether anæsthesia, and therefore there is little danger that the patient can recover consciousness while still relaxed.

With the second plan, in which weak anæsthetic agents are used, no reliable sign of the presence or absence of either consciousness or analgesia is apparent. All the instances of such a distressing occurrence appear to have taken place under this plan.

In the use of this second plan, the following three facts appear to offer a challenge:

1. There is difficulty in assessing the patient's state of consciousness and analgesia. Experimentally, if comparable doses of the weak agents are used and the relaxant is allowed to wear off, response to pain soon appears. In other words, the commonly employed doses of thiopentone, nitrous oxide and pethidine will not, over the same period, keep the patient asleep under surgical stimulation. Apnœa itself does appear to be a partial explanation of this phenomenon (Gray and Rees, 1952; Dundee, 1952).

2. The more fully curarized with "Tubarine" such a patient is, the more vague and uncertain do the indications for analgesia and anæsthesia become. The patient may well be conscious though unable to object.

3. If the patient is fully curarized with "Tubarine" as soon as the initial anæsthesia is established, and if he is kept fully curarized—and this is important—then there are no indications for additional anæsthetic or analgesic agents. This technique is the logical extension of the second plan (above). These patients all had controlled respiration throughout, and while agreeing with Gray and Rees (1952) and with Dundee (1952) that controlled respiration appears to have a very beneficial effect, we were not satisfied that this was the full explanation. To date, this method has been used on some hundreds of patients with no indication that any one of them recovered consciousness during the anæsthesia or operation. The longest case in the series covered seven and a half hours.

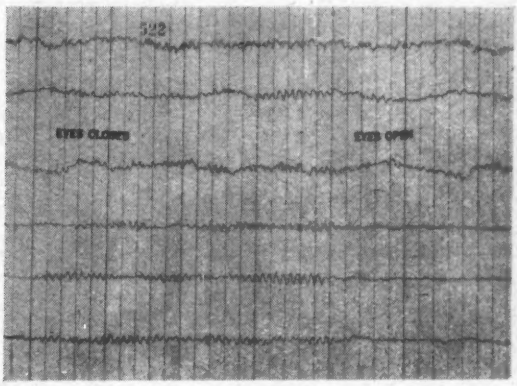

FIGURE II.
Effect of visual stimulus on normal α rhythm.

On our electroencephalographic findings the thiopentone effect was gone completely in an hour, so that for six and a half hours this patient was carried on "Tubarine" (92 milligrammes) and oxygen. The operation was a pancreatico-duodenectomy, so that it was unlikely that he was merely "hibernating". Recovery was related only to the elimination of the relaxant. The electroencephalogram appeared to offer the only means of getting answers to the questions which arise in any attempt to explain this state. Thus was this inquiry begun. The investigation is still in progress at Sydney Hospital. Our progress to date has not been great, but it is significant and forms the basis of this preliminary report.

So far we have confined our attentions to an electroencephalographic investigation of this minimum anæsthetic and full curarization sequence, because with it we get a long period of relaxant effect completely free of any anæsthetic effects. We have attempted to find out whether the patient is electroencephalographically "awake" but unable to respond. Incidental to this is the assessment of the state of the central nervous system under full curarization. Lastly we have attempted to follow the clinically dramatic recovery of the patient from curarization on the administration of "Prostigmin".

The technique used was to connect the patient before anæsthesia to an electroencephalograph so as to obtain a continuous tracing covering the whole period. Thus the first part of each record was the normal resting electroencephalogram for that particular patient (see Figure I). Premedication was mostly with "Omnopon" (one-third

grain) and scopolamine (1/150 grain). When no premedication was used the tracing showed a pronounced "anxiety state". The normal fronto-occipital electroencephalogram of a subject awake but with his eyes closed consists largely of α frequencies with a little β rhythm. In most cases the α rhythm dominates the tracing and is easily recognizable with a frequency of eight to 13 cycles per second and an amplitude of about 50 microvolts on the average. This α rhythm arises in the occipital and parietal regions and is associated with the visual cortex, for if the patient opens his eyes the α rhythm is in most cases either completely abolished or very much modified (Figure II). This we used as an electroencephalographic definition of the presence or absence of consciousness.

If anæsthesia is now induced with thiopentone (Figure III), within about twelve seconds (which is roughly the circulation time from the antecubital fossa to the brain), the electroencephalographic record undergoes a change. The α rhythm becomes completely over-ridden by a high-amplitude well-organized rhythm at 16 cycles per second which is quite different from α rhythm; it is characteristic of thiopentone. This thiopentone rhythm persists until

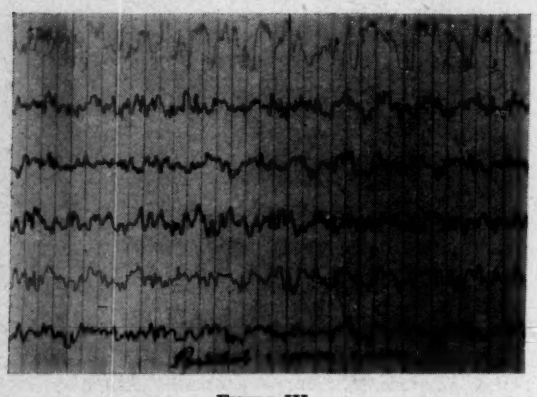

FIGURE III.

Sixteen cycle per second rhythm characteristic of thiopentone.

the subject recovers consciousness if only thiopentone has been administered. Sometimes it is not replaced by the normal α rhythm until the patient has been awake for five or six minutes. Disappearance of this thiopentone rhythm from the tracing, then, can be taken as a clear indication that the patient is no longer under the effects of thiopentone.

The usual dose of thiopentone given to these patients was 0·5 to 0·75 gramme, during the administration of which with the assistance of up to 100 milligrammes of "Scoline", intubation with a cuffed tube was performed. Controlled respiration with oxygen was then instituted and continued throughout, the patient being kept apnœic with repeated doses of "Tubarine". During intubation the cardiogram sometimes showed pronounced changes which have already been adequately described in the literature (Morton *et alii*, 1953; Rosner, Newman and Burnstein, 1953).

The electroencephalogram is completely unaffected by intubation, "Scoline", "Tubarine" or the state of apnœa, provided oxygenation is maintained. The thiopentone rhythm completely dominates the picture and continues to do so for from half to three-quarters of an hour. This approximate time period was the same for the same approximate dose of thiopentone whether the subject was subsequently curarized or not. Curarization in itself does not prolong the thiopentone effect.

At the end of this thiopentone period in the uncurarized patient, consciousness and the ability to respond returned, and with recovery the electroencephalogram reverted to the original α rhythm abolished or modified by opening the eyes. However, in the curarized patient, when the effects of the thiopentone wore off there were no clinical means of determining whether consciousness had returned or not, since the full curarization had completely abolished the effector response. In the curarized patient the electroencephalographic thiopentone rhythm tails off and is replaced by an "α-like" rhythm. We use the term "α-like" advisedly, for, although at first sight it appears to be genuine α rhythm in regard to frequency and amplitude, it is not true α rhythm, for it cannot be modified in any way by visual stimuli, as in the conscious patient (Figure IV). It bears no resemblance to the electroencephalographic record of sleep (Figure V). It resembles the electroencephalogram obtained under hypnosis and also that of hysterical blindness. In both these latter conditions the patient may not be able to "see", but a visual stimulus does abolish the α rhythm. This "α-like" rhythm, which we obtain from the fully curarized patient, and which cannot be modified by visual stimuli, occurs, as far as we can discover, in only one other condition—that is, actual section of the optic tracts at any point up to the subcortical level. Our speculative assumption is that the

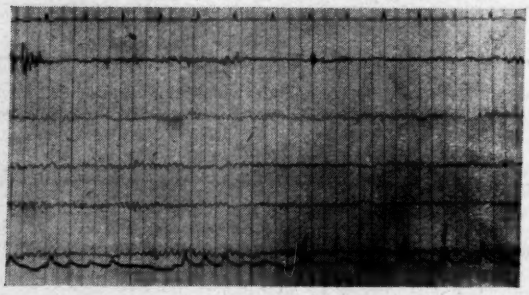

FIGURE IV.

"α-like" rhythm in the curarized patient. Unlike normal α rhythm, it is not abolished by a visual stimulus. Record after 70 milligrammes of tubarine had been given. The top tracing is a Lead II electrocardiogram. The automatic wave analysis is of the sixth tracing.

"Tubarine" has produced a pharmacological block, presumably synaptic, of the optic tracts. Does "Tubarine", then, produce, under these conditions, a block of this afferent nerve, in much the same way as we know it produces a block of efferent nerves to muscles? If "Tubarine" under these conditions has blocked the optic pathways, has it also blocked other efferent pathways? This is difficult to demonstrate, since we must depend on motor responses to show that sensory stimuli are being received by the cortex. We have some indirect evidence that disturbing afferent impulses are not reaching the brain in the electroencephalographic record itself, for if such stimuli were penetrating they would produce known and very considerable changes in the record if the patient is assumed to be conscious. All our tracings so far indicate that the central nervous system is at perfect peace with its environment. So much is this so that the operative manipulations, no matter how severe, have no effect on our records. The tracings give no indications of the cessation of surgical stimuli, so that the actual conclusion of the operation is not identifiable in the record. No change in the record occurs until the curarization is abolished. With the same anæsthetic set up we get the same tracing whether there is an operation or not. Our speculative assumption again is that the central nervous system is in a state of isolation. This state appears to be a function of the curarization, for it continues as long as the patient is kept curarized, our longest recorded period being six and a half hours after the disappearance of the thiopentone effect. The state is abolished electroencephalographically, coincidently with the clinical abolition of curarization.

During recovery no change occurs in the electroencephalogram until two or three minutes after the

administration of "Prostigmin". The first response is a return of muscle tone quickly followed by non-coordinated muscle movements. If the dose of "Prostigmin" is adequate to abolish the degree of curarization, balance is progressively restored between agonists and antagonists and coordinated movements return. At this point the patient will respond to commands. The "a-like" rhythm persists through these manifestations, and, like the emergence from thiopentone alone, the ability to modify it by visual stimuli may not return until some minutes after the patient has clinically regained consciousness. In other words, normal *a* rhythm does not reappear until the effects of the "Tubarine" have been completely abolished.

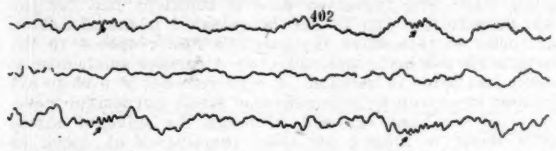

FIGURE V.
Normal sleep record. Arrows show 14 cycles per second sleep spindles.

We can make no claim that the foregoing findings are valid under circumstances other than those outlined. We do not know whether this state is the direct result of full curarization or whether it is dependent on the sequence employed. Apnœa and controlled respiration certainly prolong the effective period, but do not account for the apparently unlimited chronological effect persisting long after all traces of anæsthesia as such have disappeared from the electroencephalographic record. We have experienced some difficulty in producing full curarization in a volunteer subject without the softening-up effects of preliminary anæsthesia. It would appear that between 200 and 400 milligrammes of "Tubarine" would be required to produce full curarization of the subject (G.M.D.) in the unmodified state.

On the other hand, we are quite certain from our observations that the patient who is only partly curarized is acutely aware of his surroundings and capable of all the sensation normally credited to the conscious patient. If such a technique is used in anæsthesia, every care should be taken to see that adequate anæsthesia is provided.

Acknowledgements.

Our thanks are particularly due to the senior surgeon of the hospital, Mr. C. E. Winston, and his assistants, who so cheerfully cooperated with the surgical side of this investigation.

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A SIMPLIFIED CLOSED SYSTEM, USING ONLY INTRAVENOUS ANÆSTHESIA WITH RELAXANTS, AND A PRELIMINARY REPORT ON DOSAGE RESULTS.[1]

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THE following technique is submitted with trepidation, but as a result of its use in a considerable number of cases some interesting impressions have been formed. It is somewhat the antithesis to such techniques as described by Ruben (1953), in which nitrous oxide, oxygen and relaxants are used, with no intravenous administration of barbiturates or other central depressants. Also, it is not intended to suggest that nitrous oxide is powerless as an anæsthetic agent with the present-day higher oxygen-gas ratios, but it may suggest an altered perspective.

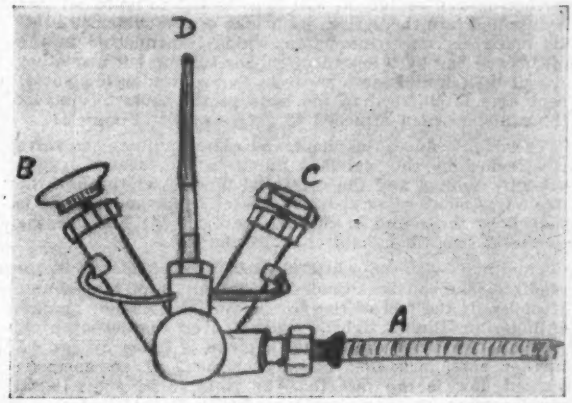

FIGURE I.
A, oxygen pressure tubing; B, fine adjustment valve; C, coarse adjustment valve; D, exit nozzle.

Since the advent of relaxants in conjunction with nitrous oxide, there have been many reports in the literature, and still many more not published, of the patient remembering some stage of the operation, the sensation being sometimes vague and sometimes vivid. If this may so easily occur, how much can we rely on an adequately oxygenated nitrous oxide mixture to produce complete analgesia at all times? Further, what minimum amount of intravenous anæsthetic supplement is required to cover its possible inadequacy?

In the technique to be described, which no doubt will be provocative, air is used in the place of nitrous oxide,

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

and oxygen is added to give varying percentages above the approximate 20% in air.

Thiopentone has been the anæsthetic agent in these cases, occasionally aided by the intravenous administration of pethidine, and the relaxants have been of the true curarizing group—*d*-tubocurarine chloride and gallamine triethiodide ("Flaxedil").

The closed soda-lime absorption system is a simple to-and-fro type with a Waters canister. A basal amount of oxygen is supplied through a fine adjustment valve, with a separate coarse adjustment arranged in tandem to supply

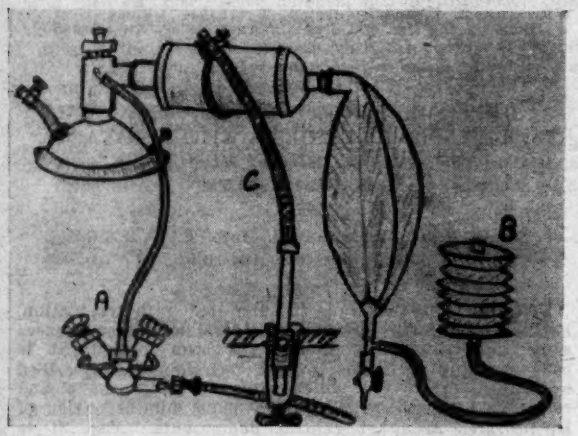

FIGURE II.

A, fine-adjustment and coarse adjustment valves; B, concertina pump; C, goose neck.

further oxygen rapidly at will into the bag (Figure I). Air is supplied into the system by means of a modified "Li-Lo" air mattress concertina pump, which is connected to the tail of the bag by a length of rubber tubing, but any other site of inlet would serve as well. For convenience a goose-neck arm is clamped to the head of the table to support the canister when attached to a face mask (Figure II).

The double fine adjustment and coarse adjustment valve is attached by the standard union to the theatre oxygen pressure tubing, and the continual flow is set through the fine adjustment valve above the basal requirements, and is judged by the sound of the hiss through the fine opening of the nozzle when held close to the ear.

This may well be criticized as being crude; but the required flow can be adjusted adequately, firstly by sound, secondly by the feel of the flow against the ear, or against a finger or thumb lightly pressed over the jet opening. Also one must not forget that a piano is tuned by ear. A further safeguard for the measurement of an adequate oxygen flow is the fact that, as it is to be above basal requirements, the bag should gradually fill. If it does not fill, there is either a leak or an inadequate oxygen supply, and the necessary adjustment in one way or the other is made.

The oxygen flow is run in through the inlet attached to the mask chimney by a connecting piece of rubber tubing. If the trachea is intubated, a "T" piece attaches the cuffed Magill catheter to the canister, and the oxygen tube is applied to the small third limb of the "T" (Figure III).

After the intravenous induction of anæsthesia, the mask having been harnessed to the face, and the canister having the bag attached, the last-mentioned is about one-quarter filled with oxygen, and then air is pumped in until it is about three-quarters full. The slightly higher than basal requirement flow is adjusted prior to induction, and is continuous throughout, with periodic checking.

Thus the first filling of the bag is amply supplied with oxygen, and after several minutes it is emptied, then half filled with air. As the oxygen flow is greater than basal needs, there will be a gradual increase in the size of the bag. When it is about three-quarters full, which may take from four to seven minutes or so, it is emptied, and the sequence of half filling it with air and allowing it to fill gradually to no more than three-quarters by means of the oxygen flow, and emptying it, is repeated again and again. Of course there can be many variations, such as adding some oxygen to the bag before adding air, as on the first occasion, and thus maintaining considerably higher oxygen percentages, or even giving oxygen alone.

Thiopentone is treated with considerable respect, and minimal induction doses are used. The criteria for the times of thiopentone administration are generally conventional. (*a*) The induction dose is sufficient just for the skin preparation, and the initial relaxant is usually given just prior to this, after the patient's first response to the barbiturate has been assessed. (*b*) A further small dose is added just prior to incision. (*c*) Increments of 0·05 to 0·1 gramme are given with the onset of slight purposeful movements of the hand or head, although the stage of anticipated onset is judged for these increments as much as possible, and sometimes relaxant may be added. If more active movements or wrinkling of the eyebrows is allowed, there is a fear of some sensation consciousness, although that state would not necessarily follow such movements. During periods of heavy curarization much vigilance is essential, as it is also with a weak nitrous oxide mixture. (*d*) A final increment if necessary of 0·05 to 0·1 gramme is given for the closing of an abdomen, or a little prior to the skin suture.

The relaxants are also used conventionally, as with a gaseous agent present in the system, and adequate dosage facilitates the minimal use of thiopentone.

No apparent difference has been noticed at the conclusion of the administration, as compared with the average patient recovering from a nitrous oxide, relaxant and thiopentone anæsthesia, and so almost invariably reflexes are definitely present, and the patients mostly react to

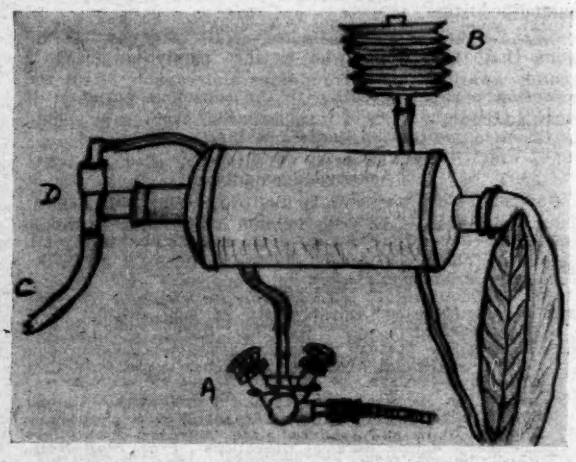

FIGURE III.

A, fine adjustment and coarse adjustment valves; B, concertina pump; C, cuffed Magill tube; D, "T" piece.

painful stimuli, which may be the last stitch or two. A large proportion of them are moving voluntarily, many phonating, or even answering questions intelligently before leaving the operating theatre. With the frequent rapid return to consciousness after the use of neostigmin, which often seems to be out of proportion to the relaxant adjustment, an impression is given that there could be a soporific action of the curarizing agents themselves.

In the very early stage of the series of over 1500, several patients stated that some consciousness had been present

TABLE Ia.

Upper Abdominal Operations (62).

Observation.	Duration in Hours.					Combined Averages. (Milligrammes.)	Totals.
	½	1	1½	2	2½		
Number of cases	9	20	16	12	5	—	62
Thiopentone dosage (milligrammes):							
Average	0·73	0·75	0·97	0·91	1·07	0·89	—
Maximum	0·85	1·25	1·75	1·15	1·30	1·26	—
Minimum	0·65	0·60	0·75	0·65	0·70	0·67	—
"Flaxedil"—average dosage (milligrammes)	153	150	176	86·5	156	144	—
Tubocurarine:							
Number of cases	1	5	7	10	3	—	26
Average dose (milligrammes)	22	25	25	33·5	26	26	—
Pethidine:							
Number of cases	Nil	2	1	5	3	—	11
Average dose (milligrammes)	Nil	50	50	58	63	55	—

TABLE Ib.

Assessment of Reflexes at Conclusion.	Duration in Hours.					Totals.
	½	1	1½	2	2½	
—	Nil	Nil	Nil	Nil	Nil	Nil
+	2	7	5	3	2	19
2+	3	10	8	3	1	25
3+	4	2	1	4	2	13
4+	Nil	1	2	2	Nil	5

TABLE IIa.

Lower Abdominal Operations (63).

Observation.	Duration in Hours.					Combined Averages. (Milligrammes.)	Totals.
	½	1	1½	2	2½		
Number of cases	13	23	17	4	11	—	68
Thiopentone dosage (milligrammes):							
Average	0·69	0·79	0·82	1·00	0·97	0·85	—
Maximum	0·95	1·30	1·30	1·45	1·50	1·30	—
Minimum	0·45	0·40	0·55	0·75	0·70	0·56	—
"Flaxedil"—average dosage (milligrammes)	139	175	143	152	170	156	—
Tubocurarine:							
Number of cases	Nil	4	6	1	5	—	16
Average dosage (milligrammes)	Nil	18	18	20	28	21	—
Pethidine:							
Number of cases	Nil	4	2	Nil	2	—	8
Average dosage (milligrammes)	Nil	50	35·5	Nil	50	45·1	—

TABLE IIb.

Assessment of Reflexes at Conclusion.	Duration in Hours.					Totals.
	½	1	1½	2	2½	
—	Nil	1	2	Nil	1	4
+	5	11	10	2	6	34
2+	5	5	3	1	4	16
3+	5	5	2	Nil	Nil	12
4+	Nil	1	Nil	1	Nil	2

during a part of the operative procedure, but on each occasion lack of judgement, or an attempt to minimize the induction dose of thiopentone beyond sensible limits was very evident. Of these patients, two complained of some sensation of pain during the incision, and the other four of a vague sensation of consciousness of short duration, at some indefinable period of the operation.

For a long time, which covers the majority, no patient except one has complained similarly; this is considered to be due to a better allocation of the thiopentone dosage increments. This particular patient gave a story so vague that it has been rejected.

Although the series amounts to a considerable number (over 1500), the dosage results presented are those of the last 137 consecutive cases concerning the anatomical regions quoted. Time has precluded the analysis of a greater number than these of the later cases, of which complete data have been recorded, and which are thus suitable for assessment. Unfortunately no collateral control cases are given, as during that period they have been in the minority for closed systems, and many have had an altered stage setting, for example during the tuition of hospital registrars et cetera. Hence the figures can be compared only in a general way with what would be considered as an average for such cases, if they were in the hands of each individual member of this audience, and using his or her own particular methods for thiopentone, relaxants, the very occasional use of pethidine, and nitrous oxide.

All know the variability from person to person of thiopentone or any other centrally acting drug. Thus for the purpose of assessment, before each patient has left the operating theatre, a record on the chart is made according to the stage of recovery of the patient, as follows: R2–, reflexes absent (like the log of wood); none were recorded in the cases tabulated; R1–, reflexes sluggish; R1+, just

TABLE IIIA.[1]
Thyroidectomy (Seven Operations).

Observation.	Duration in Hours.		Combined Averages. (Milligrammes.)	Totals.
	1	1½		
Number of cases	5	2	—	7
Thiopentone dosage (milligrammes):				
Average	0·61	0·70	0·63	—
Maximum	0·70	0·80	0·75	—
Minimum	0·50	0·60	0·55	—
"Flaxedil"—average dosage (milligrammes)	128	120	124	—
Tubocurarine:				
Number of cases ..	1	1	—	2
Average dosage (milligrammes)	20	20	20	—
Pethidine:				
Number of cases ..	Nil	Nil	—	Nil
Average dose (milligrammes)	Nil	Nil	Nil	—

"come to the surface", reflexes present, and reacting to painful stimuli; R2+, making active voluntary movements or restless; R3+, almost awake, moving actively and phonating; R4+, awake and answering questions apparently intelligently.

TABLE IIIB.

Assessment of Reflexes at Conclusion.	Duration in Hours.		Totals.
	½	1½	
–	Nil	Nil	Nil
+	2	Nil	2
2+	1	2	3
3+	2	Nil	2
4+	Nil	Nil	Nil

[1] Heavy sedation on the night before operation was employed as a routine procedure. Later premedication consisted of "Nembutal", 1·5 grains, two hours before operation, and "Omnopon" (one-third of a grain) with hyoscine (one one-hundred-and-fiftieth of a grain) one hour before operation.

The premedication used for the average adult consists of three grains of "Nembutal" on the night before operation, and "Omnopon" (one-third grain), or pethidine (100 milligrammes), with hyoscine (1/150 grain) one hour before operation to the age of fifty-five years, or with atropine (1/100 grain) above that age, unless deviations are made according to conditions such as toxicity *et cetera* or to the extreme in the age grouping.

Always the physiological needs of the patient, especially in regard to oxygenation and efficient ventilation, are paramount. A mask is used as a routine procedure, unless intubation is required on account of the surgical field, the disease present, a doubtful airway, or a poor fit of the mask. To prevent inflation of the stomach, a gastric tube of ample bore is sometimes passed, which leads through a sealable opening in the face piece, being a slight modification of that of Clutton-Brock (1953).

The completely closed system, although its supporters are becoming fewer, has a number of advantages as well as some faults; but if there is an understanding of what is in the bag, and if the bag is replenished from time to time with the desired mixture at the desired ratio, it is quite a satisfactory method when respiration is controlled. In the technique under discussion, it is chosen for convenience, as the air and oxygen problems become simple.

The numbers of cases tabulated unfortunately are so small that it would be unwise to attempt to draw very definite conclusions from them in regard to dosage results, and hence the figures are submitted as no more than a preliminary report. However, they are sufficient in number for impressions to be formed.

Conclusion.

In conclusion, the technique described is held to be practical, simple and effective for the surgical procedures in which relaxants are desired, and also satisfactory for the recovery period to follow. Much heavy equipment may be dispensed with, which often is an advantage indeed. The more fastidious need only add an oxygen flowmeter to the system to give it the appearance more of a precision machine; but in actual practice the methods explained to maintain satisfactory oxygenation are adequate and easy, and, it must be said, even fascinating.

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ANÆSTHESIA IN PÆDIATRIC PRACTICE.

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ANÆSTHESIA as a specialty has developed rapidly in recent years and is still growing fast, pædiatric anæsthesia being one of its many branches. Fundamentally, anæsthesia for children follows the same principle as for adults, but by virtue of the variation in size and weight, combined with growth and development, children offer a fascinating challenge to those who have both opportunity and time to deal with this subject.

There are many problems which are peculiar to pædiatric anæsthesia, and some of these may be reviewed, attention being paid to the important pre-operative period, a little to the anæsthesia, and finally to the post-anæsthetic recovery period. In the pre-operative period, of foremost importance is a full realization by all people who deal with children of the fact that psychological trauma may be produced, not only by the anæsthetic and operation, but also by the experiences of hospitalization and by those which must result when the child is separated from its mother. The child in hospital has aroused interest over the years, but has received more concentrated attention in recent months, as judged from the literature. An international seminar on the subject of mental health in childhood was held in Sydney in August, 1953, and in November, 1953, the Melbourne Pædiatric Society discussed the problem of maternal care and the child in hospital; an account of this discussion appeared only a few weeks ago in THE MEDICAL JOURNAL OF AUSTRALIA, and a leading article on the subject was published. These are worthy of study, as also is an article in *The Lancet* by Ronald MacKeith, who writes with considerable insight and understanding about children who enter hospitals for operation. Two recent American papers have come from James Eckenhoff (1953) in Philadelphia and from Katherine Jackson (1953) and her pædiatric and psychological colleagues. They made some very interesting studies of post-operative personality and behaviour changes which developed in children who were submitted to tonsillectomy.

It is difficult to make statistical evaluations of a subject such as this, in which data may be unreliable and reactions subjective. Fear of the dark or of being alone, fear of strangers and doctors, and regression to more childish behaviour, such as increased dependency and wanting to

[1] Read at Perth at a combined meeting of the Princess Margaret Hospital staff with the Australian Society of Anæsthetists, April 27, 1954.

be fed, occurred mostly in young children; and negativistic reactions, such as temper tantrums, disobedience and defiant behaviour, were more common in the older children. Eckenhoff showed that among the three year old children, of those who suffered a stormy induction, associated with crying, struggling, obstruction to airway or vomiting, 57% showed personality changes, and in this age group so also did 16% of those who had good inductions, but the incidence lessened with the child's increasing age. From these studies and others, it would appear that young children of five years and under suffer more adverse personality changes than the older children, and that those who are treated with consideration for emotional factors show less trauma.

All children are not affected adversely. The older children with objective interests may quickly forget their experiences if they have been well handled, and this is more likely if they have benefited physically from the operation.

It must be remembered that the parents of children undergoing operation are emotionally ill, and they may need guidance. Their behaviour is of the utmost importance in the preparation of children for the ordeals ahead of them.

At the Royal Children's Hospital in Melbourne, Dr. Vernon Collins, the Medical Director, has decreed that all parents receive a notice instructing them what to tell the child before his admission to hospital.

It reads as follows:

WHAT I SHOULD TELL MY CHILD
BEFORE HIS ADMISSION.

A Note to Parents.

You have just received a notice that your child will soon be admitted to hospital. How can you prepare him for that separation from you and home? If he is of school age, he will ask many questions and will perhaps look forward to his stay in hospital with interest, or maybe with anxiety. If he is under four or five years of age he will probably be very upset at the thought of leaving you.

Whatever your child's age, we would emphasize two things:

1. That you give your child some explanation beforehand of his forthcoming admission to hospital.
2. That you *always tell your child the truth.*

Children can usually face up to problems with great courage providing they can absolutely trust those upon whom they usually rely. You should tell him why he must come to hospital, a little about his operation and that he will be a little sore after the operation for a short time.

You should try to give a truthful picture of what will happen to him in hospital, about the nurses and their uniforms, the doctors and their white coats; that when he goes to the operating room, nurses and doctors will be dressed in white gowns and wear masks over their faces; that everybody will try to make him better as soon as possible.

Tell him that you will have to leave him in hospital, but you will see him the next day and visit him daily; and that he should call the nurse if he wants anything while in hospital. If your child is small and has a favourite toy or doll (even if a shabby one) or an old piece of blanket, be certain to let him take that to the hospital with him, and our nurses will arrange for him to take this favourite thing to bed with him. Such a familiar object greatly reassures a child in his new bed. We would like you to mark his name on these things if possible.

If you have given him a bath on the night or morning before admission, tell the nurse when you arrive at the ward, and then it should not be necessary for him to be bathed before being put to bed.

Tell the nurse about any of his habits or ways, or special words, and the name he is called by at home, so that he will more quickly feel at home with the nurses.

Operation will not be carried out on the day of admission and you can tell your child that he will be told in hospital just when his operation will be.

It may be necessary, owing to shortage of beds, to transfer him to the After Care Hospital to complete his convalescence following operation, and if so we will let you know as early as possible.

V. L. COLLINS,
Medical Director.

This is common-sense advice; but even if a child has sensible parents, who know what to tell him about his admission into hospital as well as what not to tell him, surely it is inevitable that the separation from his mother and entrance into a huge, strange room full of children, all in bed and some crying, must be a disturbing experience, however stable the child. The highly-strung child with an emotional mother must suffer acutely.

In hospital, the nurse becomes the mother substitute. This is important, particularly with small children, and a busy, harassed nurse rarely has time to play at being mother. The child must be made to feel he is an entity in the confusion of the ward, and small children sometimes require full-time attention.

The medical staff are those who set the standard of treatment in hospitals, and this problem of a child's psychological reaction is apt to be overlooked. The doctor also plays a big part in reassuring a child by gaining his confidence. The element of surprise must be avoided and the child talked to and respected as an individual. The anæsthetist does not have an opportunity to see the child until the night before operation, but it is imperative that he should do this and make friends with him.

It is again wise to warn him that we shall all be dressed up in white—himself included—wearing silly hats and masks, and that he must go for a ride on a trolley, and so on, and that we shall be upstairs to meet him when he arrives.

Many children are terrified of the needle, and I find it pays dividends to let the child himself make the choice of whether he will have a mask over his face or a prick in the arm when he goes to sleep.

It is noteworthy that children who have had a previous anæsthetic retain vivid memories which they do not wish to repeat, and almost invariably they ask for the needle.

Occasionally a child will appear in the operating theatre crying, having experienced both inhalation and intravenous anæsthesia, and he is afraid he will not get the type of anæsthetic he wishes. Most are afraid of "chloroform" and beg for the needle.

There are times when it is considered unwise to tell a very nervous child that he is to have an operation, and such a child should be put to sleep in his bed with some form of basal narcosis.

Premedication.

Premedication is a subject which gives one constant food for thought, probably because none of the drugs available is perfect. The drugs chosen must of course be suitable for the anæsthetic which follows, and these will depend on the experience of the individual anæsthetist.

If the premedication has been adequate, then the child should be brought to the theatre a little before time, so that he may settle down to sleep again after the movement of transfer.

A nurse known to the child should accompany him, the room should be darkened and have a quiet, peaceful atmosphere, and a trained attendant should persuade the child to go to sleep. If a child is awake, then the appropriate toys and books are brought forward and the child is entertained. An apprehensive child should never be left alone, and no child beyond infancy should be taken into the theatre until he is anæsthetized.

The cooperation of trained staff is essential if the hustle and bustle of the change between cases is to be kept from

the child, and an orderly or nurse who can tell stories is an invaluable person in the anæsthetic room.

All children beyond infancy are entitled to sedation, and the drugs in commonest use are the barbiturates given orally. "Seconal" is useful for the smaller children, because its action is a little quicker than pentobarbital ("Nembutal"), which is more suitable for the older children, given one and a half to two hours before operation. In the assessing of the dose of all drugs for children, weight is a better guide than age, for obvious reasons, and for these two drugs dosage is in the order of half a grain per stone of body weight, and this should be reduced if the child is feeble, fat or ill. The maximum is three grains. This form of premedication is satisfactory in most cases if the child is judiciously handled and administration is well timed. Restlessness, if it occurs in the post-operative period, is due to pain, and this may be abolished with a small dose of opiate.

During the past few years I have been using "Omnopon" and scopolamine in appropriate doses, and have been increasingly impressed with this form of premedication even in small children. The dosage is 1/24 grain of "Omnopon" and 1/1200 grain of scopolamine per stone of body weight.

At first sight these doses may appear large, but in practice this is not so. Only a few children are truly drowsy; many of them come to the operating theatre awake, but will admit to feeling sleepy if asked. Some are not even sleepy, but without fail they are cooperative, and will submit to induction with only occasional objection.

The analgesic effect of "Omnopon" is excellent before a thiopentone, relaxant and nitrous oxide anæsthetic. A larger dose is quite safe. For example, a normal child of ten years will take one-third of a grain of "Omnopon" and 1/150 grain of scopolamine, the full adult dose, without undue depression before an anæsthetic such as this. If "open ether" anæsthesia is contemplated, its irritating effects are diminished a little, but the depressant effects of these drugs must be remembered, and it is wise to reduce the dose or find some other form of premedication.

Basal narcosis with drugs given rectally takes a prominent place in the premedication of children. Tri-brom ethyl alcohol ("Avertin"), 0·12 gramme per kilogram of body weight, is still sometimes used; its chief disadvantage is that the child sleeps for a long time after it, and also it is difficult to mix and must be kept warm if decomposition products are to be avoided. Paraldehyde, one drachm per stone of body weight, has been used a great deal with success; but its unpleasant odour makes it unpopular with both medical and nursing staff. Thiopentone given rectally has been widely used and proved satisfactory in recent years. The dose is 1·0 gramme per 50 pounds of body weight, 1·5 grammes being the maximum amount used. It is best given in a 10% solution, because the small volume is less likely to be expelled. At the Royal Children's Hospital a medical officer mixes and draws up the drug, and he is near by when it is administered. In a busy surgical ward it is impossible to have every case supervised by a trained sister; therefore we bring the child to the operating theatre, and this defeats the chief virtue of the procedure—namely, that of putting the child to sleep in his own bed. For safety, each child must have trained attention, and if thiopentone is to be given rectally in a quick succession of operations then extra staff, preferably two anæsthetists, is essential.

After the injection, the average child is asleep in six to ten minutes. He may be roused, but supplementary anæsthesia is easily carried on, and of course it must be light. Normally the child wakens soon after the inhalation of the anæsthestic agent ceases, and, although he may lapse into a prolonged sleep, he may be roused from this.

The rectal administration of drugs is not always reliable. Unless the child has been prepared with an enema the night before operation, he may expel the drug. Also, as with oral administration, the effects are variable, and further, many children resent the insertion of a catheter into the rectum almost as much as they dislike a prick from the needle, and it is often these resentful children who expel the drug. The age group most suitable for rectal narcosis ranges from about eighteen months to five years. The older children, usually, although not always, consent to the intravenous injection of thiopentone.

If intravenous induction is contemplated, then the drug should be mixed in another room, out of the child's vision. Many anæsthetists charge syringes in the child's presence, often slowly, and the child becomes more and more apprehensive and the needle larger and larger, and venipuncture ends in a screaming struggle. A little thought and organization will prevent a scene such as this.

The arm should be prepared quietly and without fuss by a nurse or an orderly who knows what is expected, and when the vein is ready the anæsthetist, with a sharp needle and syringe which is properly hidden, comes into the room, and with a little chatter—and ordinary good luck—the injection is over before the child realizes what has happened.

Children of all ages, infants included, may be given thiopentone by this route. They tolerate it well and take relatively large doses. It is given in a 2·5% solution, the injection must be slow and careful, and the dosage is judged by the child's reaction. The smaller the child, the more careful must be the induction, for it is easy to give an overdose, and if "open ether" is to be the anæsthetic then only a very small sleeping dose of thiopentone should be given.

A very obvious problem in pædiatric anæsthesia is that associated with equipment when the closed techniques are being used. At the Royal Children's Hospital we have in daily use the infant and intermediate size "to and fro" canisters, as well as the child's circle canister, similar to one first designed and then used by Renton (1949) and Orton (1948) at the Alfred Hospital in Melbourne. Dead space in the infant mask measures about 29 millilitres, and in the intermediate mask about 55 millilitres, so that intubation is essential for infants if dead space is to be abolished. The gas inlet of these canisters is almost directly over the endotracheal connexion, and this assures a constant supply of fresh gases if the flow is fast enough. These canisters have proved satisfactory in clinical use. While we are on the subject of equipment, endotracheal tubes may be considered. The smallest size tubes are difficult to obtain, and are usually too soft and kink easily, particularly when the infant is lying face down—for example, in neuro-surgical procedures.

Armoured tubes in which the metal coil is incorporated within the rubber have proved useful for these operations. The internal diameter is smaller than one would wish in the smallest size, and respiration may be assisted if the anæsthesia is prolonged.

In cleft palate operations the surgeon's gag may kink a small soft tube. Compound tubes of the Rink type are popular with some surgeons and anæsthetists, and armoured tubes are sometimes used; but better still is nasal intubation, which abolishes the likelihood of kinking.

Intubation of the trachea has become common practice in pædiatric anæsthesia. It is essential if anæsthesia is to be safe for operations about the head and neck, it is essential if dead space in closed circuit anæsthesia is to be abolished, and it is the only sure method of maintaining a clear airway when relaxants are used in operations on small children. Tracheobronchitis and œdema of the glottis are the complications which must be avoided, and both infection and trauma are preventible. All endotracheal tubes, masks and connexions should be sterilized and laid on a sterile table. The younger the child, the more careful should be the attempt towards sterilization, and a tube should never be passed in the presence of acute upper respiratory infections. Trauma is avoided by procuring complete relaxation, by being gentle and deliberate, and by never using force in the process of intubation. The infantile larynx is a minute structure and differs from the adult larynx in that it is situated more anteriorly. The

epiglottis is short and overhanging, and it has edges that roll inwards instead of outwards.

A new baby's head is small and wobbly, sometimes moulding is extreme and positioning is difficult. Intubation may be facilitated in these infants and in hydrocephalics by an assistant who holds the head over the end of the table. Sometimes gentle pressure on the larynx will steady it and allow exposure of the glottis of these babies.

Before intubating the trachea of children, inspection and palpation of the surface anatomy of the larynx and trachea may help in choosing the size of tube to be used. It is advisable to have a range of different sizes, and the Magill tube numbered about half the child's age gives a working guide—for example, a number 2 tube for a four year old child, a number 3 tube for a six year old child. Under the age of eight to nine years cuffed tubes are unnecessary and best avoided for obvious reasons.

Extubation is not without danger, deaths have been reported, and in the case of feeble children, infants in particular, one must be quite sure that they have active reflexes and good muscle tone before removal of the tube. A child should never leave the operating theatre with an endotracheal tube *in situ*.

The Anæsthetic.

For adults we consider that ether is the safest although the most unpleasant of our anæsthetic agents, and this is even more so in regard to children. It is not always easy to inflate a small child's lungs with the masks we have available, and an anæsthetist must be skilled at intubating the trachea of children of all ages if he is to be safe with the relaxants.

The cautery has not yet invaded the pædiatric field of anæsthesia to the same extent as that of adults, but it sometimes forces us to use non-inflammable drugs, usually in neurosurgery or thoracic surgery.

If, as we would hope, a well-premedicated child is asleep in the anæsthetic room, it is possible, after some practice, to steal on him and take him through the first stage of anæsthesia without wakening him. Well-meaning assistants must be trained not to change a child's position or touch his hands or blankets, and, if he should wake, a little hypnotic suggestion reminds him that he consented to a mask over his face for his anæsthesia. Ethyl chloride on an open mask or nitrous oxide may be used in this way. Pure nitrous oxide is blown over the face, and the mask is gently lowered and placed into position, and oxygen is added at this stage. After this the agent of choice may be given and cyanosis must never occur.

Inducing anæsthesia by inhalation methods in a child who is awake is a good test of an anæsthetist's ingenuity. Some children are pleased to try to blow up the big balloon, others may look—perhaps distrustfully—for the pussy cat under the mask, and so on. Some just yell, and if one must be brutal then a few breaths of pure nitrous oxide give the quickest and least unpleasant form of induction, it being again remembered that cyanosis must be avoided.

As in anæsthesia for adults, "Omnopon" and scopolamine followed by thiopentone, a relaxant, nitrous oxide and oxygen give excellent results, and may be used for many routine anæsthetics, provided that venipuncture is easy and the necessary equipment is available.

If the severity of the illness or operation does not warrant an intravenous drip administration in smaller children, then some other form of anæsthesia must be chosen, such as thiopentone given by the rectum, followed by an "open ether" administration for such operations as hernia repair, appendicectomy *et cetera*.

Cyclopropane is a very satisfactory anæsthetic for children, particularly for infants. It is non-irritant and quick in its action, and the induction is usually peaceful. If a relaxant is considered advisable, then nitrous oxide is best, and an intravenous drip must be running in for babies. In new-born and young infants cyclopropane provides all the necessary relaxation, and I use this form of anæsthesia for the new-born with congenital abnormalities.

All children under closed circuit anæsthesia should receive assistance to respiration for the purpose of overcoming resistance as well as for ventilation, and new-born babies may be assisted at about 60 breaths per minute.

For operation about the head and neck—for example, cleft lip and palate repairs, neurosurgery *et cetera*—Ayres's technique or some modification of it is very satisfactory for children.

Relaxants.

There is no need to be afraid of the relaxants, for children tolerate them well and in large doses. Of those available, d-tubocurarine chloride ("Tubarine") is the most satisfactory, the dose being 0·2 milligramme per pound of body weight. The fact that "Tubarine" is not miscible with thiopentone is its only disadvantage. Intravenous drip administrations in babies and small children are easily stopped, and the drugs must be washed well away, if a precipitate which may stop the drip is to be avoided.

Gallamine triethiodide ("Flaxedil") in a dose of 1·0 milligramme per pound of body weight has proved very satisfactory for many children, miscibility with thiopentone being a real advantage. The chief disadvantage is the tachycardia which may result. Children normally have rapid hearts, and it is inadvisable to cause them to beat faster than necessary if the child is sick, and for operations inside the thorax; in these circumstances "Tubarine" must be the relaxant of choice.

Atropine and neostigmine should be given in appropriate doses if they are required.

The short-acting relaxants I have not used to any extent in anæsthesia for children, because I do not like powerful depressants which have no antidote.

If these somewhat complicated anæsthetics are given skilfully, it is possible to have the child awake before he leaves the operating theatre, and this is desirable, because the vomiting which may be expected at this stage is supervised by trained staff and suction is readily available.

In practice it is unusual for a child to vomit after a nitrous oxide-relaxant anæsthetic. After cyclopropane the child may vomit once before leaving the table and after "open ether", where sleep is prolonged, vomiting is more frequent in the ward.

Problem Anæsthetics.

Accident cases present an eternal problem to the anæsthetist, particularly among children, who vomit on the slightest provocation.

Digestion stops when the body is traumatized, and food may lie in the stomach for hours after an accident. The time to note is that between the last meal and the accident; if this is three to four hours then one would expect the stomach to be empty and anæsthesia safe. However, this is rarely what happens. More frequently the accident takes place soon after a meal, and even six to eight hours later the stomach contains partially digested food. Ideally, one should postpone the anæsthesia for at least twelve hours or more, but in practice this is not possible. It has been recommended that a stomach tube be passed before anæsthesia, but this seems a little barbarous for a child who may be frightened or shocked.

At whatever time anæsthesia is undertaken in these accident cases, careful supervision is required particularly as the patients emerge from anæsthesia.

X-Rays and Anæsthesia.

In children X rays and anæsthesia present another constant problem. There is probably no X-ray apparatus which can be guaranteed spark-proof.

It is customary to "screen" fractures at the time of reduction, and in these cases anæsthetics are given by junior members of the staff who use ether.

Anæsthetics for retrograde pyelography are usually given by a junior resident medical officer—also ether anæsthetics. The administration of a non-inflammable anæsthetic agent to a small child requires an expert anæsthetist, who is rarely available for these cases. The question arises, which is the more dangerous—a complicated anæsthetic in the hands of an unskilled administrator, or the risk of fire or explosion? I consider that there are occasions when ether must be used and the smaller risk of fire accepted. If a "blow over" ether type of anæsthetic is used, then compressed air should take the place of oxygen.

Many thousands of pounds have been spent on an X-ray room in Melbourne to make it spark-proof. The controls are in an adjoining room, and we hope that we are safe there with ether.

More and more investigations are being carried out under X rays, and some of these present difficulties in anæsthesia. The taking of bronchograms becomes more hazardous as the size of the child decreases. At the Royal Children's Hospital our children are first examined with the bronchoscope, and this lengthens the period of anæsthesia, which is usually produced with "Avertin" given by the rectum followed by ether given by the endopharyngeal method. The taking of encephalograms requires a sitting position, often for a long time. Ventriculography in babies again often means a succession of tube-obstructing positions, and there is no argument that the use of ether with the Ayres T-connexion produces the best form of anæsthesia for these small children. The use of "Trilene" is possible, but tachypnœa is an unpleasant complication if it develops. Cerebral angiography requires a trained anæsthetist, and the use of a non-inflammable anæsthetic agent with a closed circuit is possible.

Angiocardiography may tax the skill of the anæsthetist. Usually cardiac patients, these children may react severely when the dye is injected. At the Royal Children's Hospital, an intravenous drip administration is set running under local analgesia, a sleeping dose of thiopentone is injected into the solution, the lungs are inflated with oxygen, and an appropriate dose of "Scoline" is given. The opaque dye is then given, and a rapid succession of films taken during the period of apnœa provides excellent pictures. The child is usually awake and breathing well in a short time. Intubation is not carried out, but all is ready should this become necessary.

Cardiac catheterization may be performed without anæsthesia in the older children, but the large array of apparatus, combined with a long time lying in the dark, is more than a small child will tolerate. Inhalation of oxygen disturbs the catheter readings, and one must therefore use some form of basal narcosis We usually use premedication with "Omnopon" and scopolamine, and put thiopentone into the intravenous drip solution—a somewhat hazardous performance with a "blue baby" in the dark. Thiopentone is given by the intravenous route because its administration is more easily repeated and controlled than by the rectal route.

Since many of these anæsthetics in the X-ray room require a trained anæsthetist, it often falls to one person to give them. There are times when a child's head or jaw must be controlled within the X-ray field, and it is impossible to do this with small babies, wearing the gloves provided.

The possibility of too much radiation must be considered by the anæsthetist concerned, and also by those who organize these anæsthetics.

Post-Anæsthetic Recovery.

The recovery period, in my opinion, is the most dangerous part of the anæsthetic, because it is neglected. How many anæsthetists concentrate on a long anæsthetic, and then pass the patient over to a nurse, often quite junior, who flips a blanket over the patient, walks at the foot of the trolley into a lift, along corridors dimly lit or even unlit at night, into a ward also poorly lit at night, and often without a trained sister on the floor? We all know that patients emerging from anæsthesia may vomit, and that this has proved fatal. Every year lives are lost by the inhalation of blood after the so-called minor operation—tonsillectomy. Our coroners' pathologists can tell some very sad stories. Here is one as a reminder:

> An only child, a boy aged nine years, ate his evening meal at 5.30 p.m., fell off his horse at 6.30 p.m. and sustained a compound fracture of the forearm. He was anæsthetized for reduction of the fracture at 11 p.m., and ten minutes after returning to the ward he vomited and became blue. There were two doctors near by who sucked out the pharynx and made a laryngoscopic examination because the child's colour was doubtful. A few minutes later the child vomited again, and after some delay a bronchoscope was produced and passed, but too late. At autopsy it was shown that a thick *purée* type of fluid had penetrated well into the small bronchioles.

Expert attention at the time, and not after the first vomit, might have saved this child's life.

It is quite wrong to ask, and ridiculous to expect, an untrained nurse to look after patients recovering from anæsthesia, and yet this is happening daily. The responsibility is the anæsthetist's, and the problem an administrative one, and I would ask: "What are we, the surgeons and anæsthetists, doing to rectify this state of affairs?"

Our objective should be a post-anæsthetic recovery room, and this must be situated near the operating theatres on the same floor. It should be staffed with trained personnel and fully equipped to cope with any kind of emergency in a matter of seconds and not minutes.

I would stress the point that proximity to the operating theatres is essential if such a room is to function efficiently. We, the anæsthetists, are the people who know most about these problems, and it is up to us to do something about them. Many people must be educated to the idea—even anæsthetists. Matrons, surgeons and lay committees are all reasonable people, and must be made to realize the deficiencies and dangers of our present system. Shortage of nurses is the answer we receive when we grumble about junior nurses attending anæsthetic patients. I believe a recovery room would considerably reduce the burden of work in surgical wards, and in one week a nurse would learn more about the unconscious patient than she does in a year in the ward.

This problem cannot be solved quickly, and our immediate attention must be given to the training of nurses, students and doctors. In our present hospital practice, anæsthetists spend the whole of every day giving anæsthetics and often part of the night as well, and there is no time for teaching or for problems of an administrative nature. If anæsthesia is to progress, whether it be pædiatric or adult, then departments of anæsthesia must be established in our hospitals. A director is not enough. He must have well-trained assistants with time for administration, teaching and research. The ideal and safe anæsthetic has yet to be found.

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CURRENT ANÆSTHETIC PRACTICES.[1]

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The following remarks do not purport to be a comprehensive review of modern anæsthetic practice. They deal rather with a variety of prevalent methods, both good and bad, and as personal views they are no doubt open to much deserved criticism.

Anæsthesia today would appear to be in a state of transition between comparative simplicity and inordinate complexity. This tendency is often more apparent than real, and certainly is not unidirectional; trials of complicated methods frequently end in a reversion to something more practical and perhaps less hazardous than the novelty. Conversely, absolute simplicity, as exemplified by the ether or nothing school, is repugnant to most anæsthetists and patients too. In general, the rule should be always to seek and to apply the principle of the happy medium in anæsthetic procedure, so as to get the best over-all results with "minimal" fuss and risk for all concerned.

Most anæsthetists exercise a proper restraint in their assaults upon the human organism; but some, perhaps in ignorance or even from negligence, subject it to unwarranted insults and hazards, both physiological and pharmacological. Admittedly, there is quite often ample justification for the use of risky anæsthetic procedures, especially in extensive and difficult surgery which may offer the only means of relief from otherwise hopeless conditions. For example, recourse to induced hypotension in dealing with intracranial aneurysms is often justifiable, but is of highly dubious merit in most other types of surgery, because directly attributable complications, ranging from anuria to blindness, have been far too common afterwards. No doubt its scope is widened in expert hands and selected cases; but even under these conditions highly disconcerting and perhaps disastrous sequelæ can occur.

Physiological Aspects.

In recent years there has been an increasing tendency to indulge in what is euphemistically called physiological trespass, whereby serious inroads are made upon the safety margins of the body. Induced hypotension is a case in point, and for reasons already mentioned is rapidly declining in favour. Its casual employment by tiros, frequently on the insistent demand of persons solely interested in surgical convenience, is to be condemned.

Of course, the idea of such trespass is not new; ever since anæsthesia began many liberties have been taken with normal bodily processes. Most of these abuses are of comparatively minor character, and the subject will recover from them satisfactorily. One of the commonest is oxygen deprivation, of all grades from slight to severe. Variable degrees of carbon dioxide excess often accompany it. Thus partial smothering has been utilized for years to produce deeper anæsthesia—a practice which reached its zenith (or nadir) in the gross suboxygenation required for the application of unsupplemented nitrous oxide anæsthesia in major surgery. Even today hindrances to oxygen uptake and carbon dioxide elimination may be frequently seen, ranging from excessively thick cloth masks, partially obstructed airways and inexpert use of apparatus to lack of proper aid to depressed breathing.

The margin of tolerance to such abuses is often narrow, especially in the seriously ill and the aged. In these cases deep anæsthesia, or its equivalent as provided by the relaxing agents, involves an urgent need for artificial pulmonary ventilation. Some would appear to believe that the exhibition of high concentrations of oxygen alone is sufficient. Others place reliance on the free flow of a gaseous mixture containing adequate oxygen, and maintained at increased pressure by restriction of its external escape. Both ideas are fallacious, even if many patients do tolerate their impact. Efficient rhythmical assistance to respiration is imperative in such circumstances. It is therefore pleasing to see a Waters bag and absorber outfit used, for example, to aid breathing during thiopentone and curare anæsthesia. But when a piece of corrugated tubing of such length as to increase the "dead space" by 250 cubic centimetres or more is interposed between the mask and canister, hypercapnia is inevitable, despite wasteful inflows of oxygen.

The use of high concentrations of oxygen and the neglect of good ventilation during anæsthesia increase the risk of subsequent pulmonary atelectasis. This risk is aggravated by large gas flows, which tend to deplete the lungs and body of nitrogen. By virtue of its slow absorbability nitrogen is valuable for the maintenance of alveolar patency. Therefore free ventilation with air is always desirable at the end of any inhalational anæsthetic.

A further advantage of good ventilation is that it prevents hypercapnia and the resultant increased bleeding from the raised blood pressure and peripheral vasodilatation. The way in which a swollen brain will shrink back when adequate ventilation is practised is quite striking, and illustrates the fallacy of using hypotensive drugs before the possibilities of simple physical measures have been exhausted. Yet another useful feature of artificial ventilation is its use for the deliberate production of hypocapnia, a state not so deleterious as was formerly believed. Hypocapnia impairs the dissociation of oxyhæmoglobin, so that perhaps in some minute way the cellular oxygen requirements are less readily met. Thus it becomes possible to prolong anæsthesia at very light levels and without obvious ill effects, breathing being resumed within a few minutes of the cessation of hyperventilation.

Postural strangulation is another result of physiological trespass. The efficiency of both respiration and circulation can be gravely impaired by various postures, of which the prone, "jack-knife" and steep Trendelenburg positions are the worst offenders. Here the surgeon, and the anæsthetist no less culpably yet obediently, will keep the patient lying, say, in the unmitigated prone or "jack-knife" position throughout some prolonged operation on the back. Breathing and the cardiac output become seriously impaired and venous congestion becomes severe—an effect which artificial ventilation under pressure will only aggravate. The absurdity and danger of giving some hypotensive drug in such circumstances should be obvious. So, too, should be the alternative advantages of the lateral posture in very many cases. Contrary to former belief, the sitting posture is not strikingly deleterious, presumably because it does not interfere with pulmonary ventilation and cardio-vascular efficiency.

Pharmacological Aspects.

The day of the all-purpose single agent is long past, and despite gibes about polypharmacy there is ample evidence of the efficacy and safety of judicious drug combinations in modern anæsthetic practice. Thus various schemes of premedication and synergistic anæsthesia have been employed with satisfaction for years, all being subject to the general rule that dosages should be moderate and reasonably balanced. However, provided that the physiological basis of anæsthesia is sound, a good deal of pharmacological trespass becomes permissible.

The introduction of the relaxing agents marked a profound change in this direction. Maximal paralysis and minimal anæsthesia became fashionable, and even today the true perspective has hardly been regained. Perfervid enthusiasts still display pride in the fact that they have been able to conduct prolonged major anæsthetics on the basis of, say, 0·2 or 0·25 gramme of thiopentone with "free" pethidine, sundry relaxants and gases, rounded off with liberal doses of atropine and neostigmine. Any suggestion that some ether might have been of alternative help, especially for wound closure, is regarded as rank heresy, despite its well-known potentiating effect on curariform agents. The point is that adequate dosages of thiopentone,

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

ranging from 0·5 to 1·0 or even 1·5 grammes in the earlier stages of many operations, are not harmful.

Admittedly the foregoing complicated procedures may sometimes be justified, but for the great majority of cases a much less elaborate technique is sufficient. Not infrequently they fail in the object of sending the patient back to bed either lightly asleep or conscious, so that an anxious time is passed by nurses and others while he slowly recovers. In such circumstances there is a great temptation to give stimulants, antidotes, analeptics *et cetera*, whereas oxygen and patience are the sovereign remedies.

Recently there has been a tendency to revert to heavier premedication, based on the fact that certain drugs, notably the longer-acting barbiturates, depress metabolism and so reduce oxygen demand. Thus phenobarbitone will be given on the preceding evening in a dosage of three grains (0·19 gramme) and repeated, perhaps in smaller dosage, on the following morning. About one hour before operation pethidine or "Omnopon", with hyoscine hydrobromide or atropine sulphate, is injected in the usual dosage. This procedure will induce a state in which relatively small quantities of anæsthetic and adjuvant agents, including relaxants, are subsequently required. The oxygen demand and carbon dioxide output are significantly reduced, so that little, if any, aid to breathing is necessary. The whole thing sounds rather idealistic, and its efficacy in major abdominal surgery would seem to be questionable. Afterwards the patients remain drowsy yet rousable for several hours, and are said not to cause any anxiety. In contrast with former schemes of this nature, lung complications are rare, thanks, presumably, to the antibiotic drugs.

At present a similar procedure has some vogue in the ophthalmic surgery of elderly persons. Either "Sodium Amytal" or "Nembutal" is given in full dosage instead of the phenobarbitone, and the pethidine *et cetera* are given as usual. Anæsthesia is maintained with minimal amounts of thiopentone, and the tone of the eye muscles is reduced by subparalytic doses of "Flaxedil". Intubation is not required, and the breathing remains adequate to the reduced oxygen demand. Special nurses are frequently needed to care for these patients both before and afterwards.

Pharmacological trespass — or transgression — would appear to be maximal in the recent activities of certain French workers. They use anything up to a dozen agents in various combinations and dosages, given before, during and after the operations. The objects have been to reduce metabolic activity and oxygen demand; to procure a central and ganglionic depression of the autonomic nervous system; to abolish excessive responses to noxious stimuli and conditions (for example, hæmorrhage); and so to prevent shock. The ultimate achievement is the establishment of a state of hypothermia or artificial hibernation, which indeed has been of value in some drastic operations, as in cardiac surgery.

Undoubtedly there must be a basis of reason and truth in all this confusion, and so further investigations are warranted. At present the main component of the procedure is the "lytic cocktail", consisting of chlorpromazine ("Largactil"), promethazine ("Phenergan") and pethidine, which may be given in repeated doses over several days. The need for the anæsthetic agents and their adjuvants is said to be quite "minimal"—a dubious recommendation indeed. British opinion in the matter is generally critical and guarded, although a few favourable reports have been published. The method must certainly involve heavy demands on nursing personnel and services.

Practical Aspects.

During the past twenty-five years—or quarter-century if preferred—extraordinary changes have taken place in the concepts, agents and procedures of anæsthesia. These changes have generally been accompanied by increasing complication of method, which in turn has necessitated much more attention to detail than was formerly required. Nevertheless the basic principles remain unchanged, even if they are very much better appreciated nowadays. Proper ventilation with a suitable medium is the primary essential in all forms of anæsthesia, local or general, and no factor that interferes with this to more than a limited degree should be tolerated for any length of time.

A few case reports are submitted to illustrate various points. The widespread use of gas anæsthetic machines involves a number of hazards, including those of empty oxygen or wrongly-coupled nitrous oxide cylinders, inefficient check valves, exhausted soda-lime, excessive dead-space, kinked tubes *et cetera*. The following case illustrates the danger of covering gas cylinders.

CASE I.—Induction of anæsthesia in a male patient, aged about sixty years, was conducted with thiopentone and decamethonium, after which artificial respiration was begun with nitrous oxide and "oxygen". When the incision was made the blood was seen to be very dark, so more "oxygen" was given and vigorous lung-ventilation was performed. Despite maximal "oxygen" the patient's blood became quite black, whereon the surgeon, on the basis of a similar experience only a few days previously, diagnosed wrong coupling of gas cylinders. The smart green covers of these were removed and a cylinder of nitrous oxide was found to be on the oxygen yoke in use. Control was quickly regained with genuine oxygen from the reserve cylinder, and the operation was completed without further incident. The patient made a rather slow recovery from the anæsthetic, accompanied by a good deal of restlessness. Death occurred two days later from coronary occlusion or thrombosis.

Ether containers have also been left turned fully on, with alarming, if not disastrous, consequences.

CASE II.—A man, aged fifty-seven years, was undergoing thoraco-lumbar sympathectomy under endotracheal nitrous oxide, oxygen and ether anæsthesia. On leaving the operating theatre to get some "Tubarine" from his bag, the anæsthetist turned the ether dial, as he thought, off. Instead he had turned it fully on. On returning to the operating theatre less than one minute later he found the patient "dead", presumably from reflex cardiac inhibition due to the intense action of strong ether vapour. Fortunately vigorous inflation with oxygen and repeated right auricular puncture restored animation within a few minutes, and the patient later made a trip to the United States of America.

CASE III.—A woman, aged about twenty-five years, was given thiopentone and "Tubarine" before tracheal intubation for pulmonary lobectomy. Artificial respiration was maintained from the outset. About ten minutes later, on the completion of posturing, no blood pressure reading could be obtained. It soon became obvious that cardiac arrest had occurred, and rapid exposure of the heart showed it to be inactive. At about this stage the ether dial of the machine was found to be turned fully on, apparently having been left in this position throughout. Persistent cardiac "massage" and the injection of adrenaline ultimately restored a satisfactory cardiac rhythm, after which large quantities of ether vapour were evacuated from the patient's lungs. She never regained consciousness, and died about twelve hours later in a state of hyperpyrexia.

These three cases are a salutary reminder of the necessity for great care in the handling of anæsthetic apparatus, as well as for its proper checking before and after use. Ether containers should always be emptied at least on the conclusion of each day's work. Many other examples of minor and major trouble associated with modern methods of anæsthesia could be quoted. Obviously the more detail involved in any procedure, the greater the potential risks. Therefore proper training and wide experience are essential for efficiency and safety, failing which the use of simpler methods is advisable.

The current popularity of electro-coagulation among many surgeons, often of most unreasonable dimensions, involves substantial hazards and is a source of much unnecessary trouble and anxiety to anæsthetists. Although chances were taken in the past, the position today is that any likelihood of ignition must be offset by the use of non-inflammable agents—a specialized procedure. The casual use of diathermy for trivialities is absurd and dangerous; it also interferes greatly with standard teaching, in seriously reducing the amount of clinical material available.

Of minor practical lapses two come readily to mind. Although the efficiency of alcohol as an antiseptic is often questioned, methylated spirit is used by many anæs-

thetists for the sterilization of their syringes, needles *et cetera*. Of course, as such articles are used for the sole purpose of giving intravenous injections, their serious contamination must be very rare. In addition, this being their owner's responsibility, they are usually rinsed out thoroughly with water and spirit soon after use. Alcohol, at any rate, is a good detergent, and its employment as above indicated makes for a satisfactory routine of cleanliness. But nevertheless a serious danger, the transmission of serum hepatitis, still exists. Therefore, thorough boiling should be employed for sterilizing all parts apt to be contaminated with blood, and this applies especially to needles, vein-seekers and connecting tubes.

Some anæsthetists will, on occasion, use sterile tap-water either to make or to dilute thiopentone solutions. A long trial of this practice, at any rate with Sydney water, has been convincing as to its innocuity. The pyrogen bogy is apparently insignificant with the small volumes of water employed, and there has been no evidence of infection attributable to the method. Moist sponges, rinsed out in sterile water, have been used with impunity for years for abdominal packing, which indicates an extremely slight infection hazard from this source. The conditions existing in the blood-stream and vessels would therefore seem to ensure adequate protection in this regard.

Teaching Aspects.

From the foregoing it is obvious that comparative simplicity must be the watchword of the average anæsthetist, and so all ordinary teaching should be based on this assumption. Contrary to widespread surgical belief, proficiency in specialized anæsthetics cannot be achieved in a few weeks; something like three years is nearer the mark.

During a recent brief tour of several country towns the anæsthetic requirements of general practice were discussed with various doctors. There was almost unanimous insistence on the necessity for the thorough training of recent graduates in the simpler inhalational methods. Proficiency in the ordinary open and endotracheal ether techniques was thought indispensable under the present conditions of country practice. Intravenous methods were considered to have limited applicability. The man apparently quite familiar with gas machines, but obviously useless with the "rag and bottle", was viewed with distrust, especially since, under prevailing conditions, opportunities for the exercise of his special aptitudes were relatively infrequent. Where sufficient scope existed the value of specialized methods was admitted, but there was little inducement for anyone to devote much time to them. Occasional enthusiasts had made themselves familiar with various refinements, including some application of the relaxing agents; but conformity with local custom and opinion was generally the rule.

Although the foregoing state of affairs seems to be capable of much improvement, this must of necessity be a comparatively slow process, involving education of both the medical profession and the public. Meanwhile, students and new graduates should be given adequate instruction in standard methods, and facilities for proper training should be established for those wanting more detailed or special knowledge.

For many years ether given by the open method has been the corner-stone of the teaching of anæsthetics in this country. "Straight" ether, or the ethyl chloride and ether sequence, has been the common standard. Lately, however, public demand has led to a widespread use of thiopentone, given intravenously, for induction purposes. This agent, although thought likely to spoil the teaching value of a plain ether induction, has been found rather to be a useful aid, provided its dosage is limited to 0·2 or 0·3 gramme. When what in these circumstances is too much thiopentone—0·5 gramme or more—is given, especially if the premedication has been at all liberal, the depression of respiration and laryngeal hyperirritability will make the change-over to ether difficult.

After this preliminary injection a skilful change-over to ether, aided perhaps with a little ethyl chloride, will provide advantages to all concerned. The patient is pleased and suffers few after effects, even when the ether supplement has been most lavish. The honorary surgeon who promised "the needle", often under some duress in his consulting rooms, is gratified. The junior resident medical officer is excited at the prospect of giving an intravenous injection. With careful instruction and supervision the student is able to carry his subject into surgical anæsthesia with remarkably little delirium. Apparently the terrors of the mask are abolished; and yet the progressive signs of anæsthesia are still readily demonstrable.

Summary.

1. Some current trends in anæsthetic practice are reviewed and various abuses indicated.

2. Physiological trespass and pharmacological transgression are discussed.

3. Case reports demonstrating certain practical hazards are submitted.

4. The necessity for comparatively simple methods for teaching and general use is stressed.

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EPIDURAL BLOCK FOR ANALGESIA AND INDUCED HYPOTENSION.[1]

By Russell Cole, D.A. (London), D.A. (Melbourne), *Melbourne.*

Local anæsthetic agents are introduced into the epidural space and bring about their effect by eventual intimate contact with the spinal nerves in the paravertebral space. This produces adequate relaxation and analgesia to the supplied area. The fall in blood pressure is brought about by the effect of the local anæsthetic agent on the sympathetic ganglia and *rami communicantes*.

Indications.

General anæsthesia has now reached such a high standard, and is of such low toxicity and great safety in expert hands, that the indications for local analgesia are practically non-existent. With regard to induced hypotension in anæsthesia, it is now recognized that this brings about additional risks and dangers to the cerebral, coronary and hepatic circulations. Therefore, the indications for such a method of anæsthesia for an operation are very few. However, it is thought that for some selected operations this method of producing ideal conditions for the surgeon is well worth the additional risks to the patient.

The real indication for its use is where the continual blood loss is hampering the surgeon's view and affecting the results and efficiency, as well as prolonging the time of the operation. This occurs in positions of restricted approach and retraction, in such places as the cranium, pelvis and vagina. The amount of blood lost is less than a quarter of that lost under routine general anæsthesia. When the blood loss is over two litres, even though it is immediately replaced, the patient often has a stormy three or four days after operation. With the reduced blood loss these incidents of sudden collapse needing further intravenous therapy have been avoided.

Since the time of Crile, the reduction in the amount of shock brought about by a nerve block to the part subject to trauma has been noticed. There appears to be no doubt from a practical standpoint that, when an operation is performed on a part of the body that has been temporarily isolated from the central nervous system, the amount of shock and reaction produced is very much less.

It has been noted in all the cases of this series that the general well-being of the patients after operation has been

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

much better than would have been expected for the magnitude of the operation undergone. For these reasons then —(*a*) improved vision of structures in the operation field, (*b*) saving of operating time, (*c*) decreased blood loss, (*d*) decreased shock, (*e*) decreased immediate post-operative pain—this method of anæsthesia is suggested as offering the best means of successfully operating on a few selected patients requiring very radical and prolonged surgical procedures.

It has been difficult to collect a sufficient number of such large-scale operations over the last six months, so the technique was practised on several types of operations for which it is definitely not advocated or designed.

The following were the operations performed under epidural analgesia: vaginal repair (16), Millin procedure (five), abdomino-perineal excision (two), Basset's vulvectomy (nine), local excision of vulva (one), excision of melanoma of leg and glands of groin (two), exenteration of pelvis (one), Wertheim's operation (11); a total of 47.

There have been two deaths in this series. One was that of a woman, aged seventy-eight years, on the third day after a Basset's vulvectomy, from a coronary occlusion. She had previously had an occlusion one year before. It seems hard to imagine the connexion between reducing the blood pressure from 160 to 80 millimetres of mercury, systolic, for three hours and the sudden collapse and death from coronary occlusion three days later. It would seem more probable that the increased metabolic response to injury which follows after every insult to the body was responsible for the coronary occlusion, as the patient appeared very well during the days after operation. Also, there would almost certainly have been large fluctuations in the blood pressure during the operative and post-operative period of such a patient if ordinary anæsthetic technique had been used. Coronary disease, of course, is a well-recognized contraindication to hypotensive anæsthesia. The second death occurred ten days after a Wertheim's operation and was due to a surgical complication not related in any way to the anæsthetic.

Anatomical Problems.

The space between the *dura mater* on the inside, and the vertebral bodies and ligaments on the outside, is limited above by fusion of the dura to the *foramen magnum*, and below is continuous with the sacral canal. The outlets of the space are the intervertebral foramina, which are plugged to a varying degree by a segmented nerve and fibrous tissue. The lower lumbar foramina are the smaller and also house large nerves, whereas the middle thoracic foramina are larger and house small nerves. This would suggest that the local anæsthetic solution should more easily pass out into the paravertebral space in the thoracic area. However, the amount of fibrous tissue varies also, and this appears to be the factor determining whether or not the fluid passes out through the foramina. Hence this factor determines whether or not the analgesia is patchy; in other words, if the anæsthetic fluid is blocked from tracking out through a number of adjacent vertebræ, then a corresponding area supplied by those nerves will be sensitive.

Separating the sacral canal from the vertebral canal, there is a varying amount of fibrous tissue which is important in limiting the upward extension of a sacral block as well as the downward extension of an epidural block. However, gravity aids the flow in an epidural block.

When the transverse section of the vertebral canal is considered, it is seen that the epidural space is one-quarter to five-eighths of an inch in extent posteriorly in the mid-line; that is, a quarter of an inch *plus* between the *ligamentum flavum* and the dura; this rapidly decreases laterally to practically nothing. Thus it is seen how important it is to insert the Tuohy needle in the mid-line, where there is much more space and less likelihood of puncture of the *dura mater*.

The space contains a varying amount of fat and loose fibrous tissue. The catheter usually slips easily up the space, although the resistance met is in some cases quite appreciable, and, when the catheter is withdrawn, kinks and twists are present. Thus, it is impossible to be sure exactly how high up the tip of the catheter has progressed; also, it is possible for the catheter to meet sufficient opposition to be turned downwards back on itself.

The shape of the vertebral canal in the supine patient determines the levels of analgesia in epidural as well as in spinal anæsthesia. In the lumbar region, the highest point lies between the third and fourth thoracic vertebræ, and thus a local analgesic agent introduced at this point will tend to run equally downwards towards both the sacral and the thoracic parts of the canal. The lowest point lies at the level of the fifth thoracic vertebra, so that a large amount of fluid introduced will form a pool in the hollow between the third lumbar and fourth thoracic vertebræ. This will then obviously give sufficient relaxation and analgesia to cover the abdominal wall and splanchnic area. However, this allows the remainder of the body to compensate and maintain the blood pressure near to normal levels. The hæmorrhage in these cases is less than with general anæsthesia, but is still troublesome. Theoretically, this compensatory vasoconstriction over the upper part of the body could be dangerous when one considers the blood supply to the brain. It also could provide ideal conditions for such abnormalities as cerebral aneurysms.

In the cervical area the canal again reaches a similar height to the lumbar region. Hence, in order to affect the upper sympathetic output, tilting in the head-down position is necessary.

The spinal segmental nerves whilst in the epidural space are covered with *dura mater*; this extends from the main dural sheath along the nerve. The spinal nerves are bare of this covering outside the vertebral foramen in the paravertebral space, and it is in this position that the local analgesic agent brings about its effect and also comes into direct association with the sympathetic chain. Thus an epidural block by this method is really a complete paravertebral block through one injection. The fluid tracks from the lumbar region up and down the canal and out through the intervertebral foramen and finally reaches the paravertebral space.

Technique.

A Huber pointed Tuohy needle is used to introduce a catheter into the epidural space. Massey Dawkins insists that a nylon catheter should be used, but it has not been possible to obtain this yet. A polyvinyl catheter obtained from Becton, Dickinson and Company has been used in this series. It has a much greater tensile strength than polythene tubing, which is easily snapped and dangerous to use.

Barbiturates are used for premedication because of their protective effect against convulsions, produced occasionally by the side-effects of the local anæsthetic solutions used. "Nembutal" (three grains) has been used in half the cases, and "Omnopon" (one-third of a grain) and scopolamine (1/150 of a grain) in the other half, the latter combination for the patients aged under sixty years.

A full skin preparation with cap, mask, sterile gown and gloves is carried out. The sitting-up position is used with the patient resting the elbows on the knees.

Local anæsthetic agent is introduced between the spines of the third and fourth lumbar vertebræ. The attendant then presses downwards on the patient's shoulders, thus flexing the trunk without causing the patient to lean forwards. A Sise introducer is used to puncture the skin and make a track through the interspinous ligament down the *ligamentum flavum*. It is extremely important to aim straight down the mid-line. This is made easier by having the patient sitting straight with the shoulders level and having a track made by the Sise introducer. The introducer is now withdrawn and a size 16 Tuohy needle directed down the tract made by the introducer.

The needle is felt to enter the *ligamentum flavum*, where the resistance is much greater; it is then felt to go through, and the resistance then becomes much less and the needle progresses easily. Now, provided the needle is exactly in the mid-line, there is about one-quarter to three-eighths of an inch epidural space before the needle perforates the

dura mater. The needle is then rotated until the bevel is facing upwards and a catheter 24 inches long is now threaded down the Tuohy needle. It goes easily into the epidural space, and if it does not proceed easily through the needle then probably the needle is still wholly or partially in the *ligamentum flavum*. The catheter is threaded through the needle for a distance of about 10 inches.

The various types of indicators were tried in the earlier cases, but it was found that they were at times misleading. A negative pressure was rarely found to be present. Arterial pulsation with the Odloms indicator was noted in many patients, but not in all. It was found that the sense of touch was the most reliable after only a limited experience.

The needle is now withdrawn together with the catheter until the needle is free of the skin, and then the needle is slipped freely over the catheter; this leaves about six inches of the catheter deep to the skin.

If no cerebro-spinal fluid escapes either from the needle on insertion or from the catheter, then it is considered definitely not to be in the subarachnoid space.

If the subarachnoid space is accidentally punctured by inserting the needle too far, the needle is immediately withdrawn and the space between the second and third lumbar vertebræ is used. This has been done in two cases without any ill-effect. There is an extremely large stream of cerebro-spinal fluid when the *dura mater* is punctured and the subarachnoid space is entered, as the bore of the Tuohy needle is so large. There is thus no doubt when the catheter is introduced to the subarachnoid space. Ten cubic centimetres of 1% "Xylocaine" solution are now introduced, a size 25 needle connecting the syringe to the end of the catheter. This dose (i) acts as a trial dose to see if the patient reacts to "Xylocaine", (ii) determines whether the local anæsthetic solution is entering the subarachnoid space and producing total spinal anæsthesia, and (iii) acts as the dose blocking the sacral nerves, gravity aiding the flow of local anæsthetic solution to its destination. Gravity also helps to localize the effect if for some reason the solution introduced was entering the subarachnoid space. Many of the reports of convulsions following the use of "Xylocaine" show that this occurs after small amounts of the drug have been given.

After four or five minutes from the start of injection of the "Xylocaine" solution, the patient is laid flat with the catheter leading out to one side, lying unkinked and without much weight resting on it in the concavity of the lumbar region. There is not absolute paralysis of the legs, but more a feeling of heaviness. There is paralysis in spinal anæsthesia affecting the lower segments. The foot of the trolley is now raised one foot to allow a head-down position. Twenty cubic centimetres of 2% "Xylocaine" solution are now introduced. At the completion of this procedure, which takes two or three minutes, the patient often replies on being questioned that she feels slightly light-headed. A further 20 cubic centimetres of 1% "Xylocaine" solution are then introduced, and at the completion of this dose the patient is visibly losing interest in the surroundings and becoming sleepy. The trolley is now levelled, and this usually increases the effect. The procedure of tipping the patient is not followed (i) for those aged over sixty years, (ii) when the systolic blood pressure is over 200 millimetres of mercury, or (iii) when the general condition is causing anxiety.

At this juncture the blood pressure decreases, sometimes dropping to 60 or 70 millimetres of mercury, systolic; but in the younger group it often remains around 100 or 110 millimetres of mercury. No attempt is made to reduce the blood pressure to any particular level. If the patient exhibits no effect after the introduction of the 20 cubic centimetres of 1% "Xylocaine" solution, a further 20 cubic centimetres of 1% solution are injected, and on two occasions a further 10 cubic centimetres of 1% "Xylocaine" solution were used before any pronounced effect was noticed. This made a total of 0·9 gramme of "Xylocaine", which is under the recognized maximum dose. The average dose in this series was 0·65 gramme.

The pulse rate often slows to 50 or 60 per minute, which is the result of the blocking of the sympathetic accelerator supply to the heart from the upper thoracic segments; this leaves the vagus-inhibiting effect to prejudice the pacemaker of the heart. The sleepiness is due both to the side-effects of the "Xylocaine" and to the decrease of sensation over the major part of the body, which decreases the nervous impulses to the nervous centres and induces sleep (Kleitmann's theory of sleep). The patient in this condition needs very little thiopentone to induce sleep—generally about 0·1 to 0·3 gramme is sufficient.

For surgical procedures that do not require a steep Trendelenburg position, the patient is just given oxygen through an intranasal catheter. It is noticeable when general anæsthesia is used, and especially in brain surgery, that if nitrous oxide and a closed or semi-closed circuit are used with carbon dioxide absorption, the capillary oozing is greater. All general anæsthetics are vasodilators to some extent, and carbon dioxide acting centrally causes vasoconstriction; but also perhaps it acts peripherally in the capillaries as a metabolite causing vasodilatation. For the large pelvic operations requiring a fairly steep Trendelenburg position, retractors and packs, intubation is carried out with the use of the same dose of thiopentone and a "Decicain" or cocaine spray on pharynx, larynx and trachea. Ventilation is then carried out, and controlled respiration is easily obtained and maintained.

The patient is then taken into the operation room and postured, the catheter being either removed or left *in situ* on a sterile towel, the end being brought out to one side.

Maintenance.

In no case has a further dose of local anæsthetic been given, for three reasons. The first is that all the operations performed have been completed in two and a half hours, most of them in two hours or less. The analgesia has been perfect for that length of time; however, on three occasions the relaxation was inadequate for closure of the abdomen after removal of the Devine's retractor, and small doses of "Flaxedil" were used—40 milligrammes—which were quite adequate. Secondly, in all cases in which a second dose was required (Wertheim's hysterectomies), the Trendelenburg position was used, and because of this steep posture it was considered that the wrong segments would be affected. Thirdly, it was considered advisable to time the injection of the dose of local anæsthetic solution so that the blood pressure would have nearly returned to normal at the completion of the operation. This would help the control of any bleeding points and thus prevent reactionary hæmorrhages. However, no hæmorrhages occurred among the patients sent back to the ward with a low blood pressure.

It would be expected that less bleeding would occur without any additional agents other than the epidural anæsthetic. However, the ordeal was considered too great to expect anyone to remain awake, and a small dose of thiopentone (0·25 grain) was found to be sufficient for a two-hour period; the patient slept peacefully most of the time, but could be made to stir with stimulation to the face. One patient who underwent a combined abdomino-perineal excision of the rectum had no thiopentone given and remained awake and comfortable during the hour's operation. However, it was interesting to note that he became quite deeply unconscious at the time of the operation when there was an opening right through the pelvis. When this aperture was closed he regained consciousness.

Type of Local Anæsthetic Agent Used.

"Xylocaine" was used in all the cases in the above-mentioned doses. This drug appears to be the most reliable agent, and also its duration of action of approximately two hours fits in perfectly with the usual operating time of the surgeons and with the type of cases for which this technique was designed. The use of adrenaline with the

"Xylocaine" was not considered necessary and would also have introduced another danger and complicating factor. The use of a longer-acting drug such as "Nupercaine" would appear to be a better way of prolonging the action. This can be mixed with the "Xylocaine".

"Xylocaine" in the above-mentioned doses has not produced any undesired side-effects in this series. No cases of convulsions occurred, but one patient showed slight twitching at the corner of the mouth; this disappeared after one minute. However, all the patients in this series would have a high threshold of stability to the induction of fits, there being no predetermining factors, other than congenital, to prejudice the nervous system.

There appear to be no definite cases of death due to "Xylocaine" in the American literature, and several series of 100,000 to 200,000 cases have been recorded.

The Post-operative Management.

After gigantic surgical procedures, the less a patient is moved the better, and there should be no hurry to move the patient onto the bed. This should be brought into the operating theatre in order to save the extra move and rough ride down to the ward on a theatre trolley. The patient is laid flat with the head resting on one low pillow; it is very uncomfortable for most patients to lie flat in bed conscious and without a pillow. The foot of the bed is not placed on blocks, for should the patient be in such a condition as to warrant this procedure, other resuscitational measures such as further blood transfusions or even the administration of noradrenaline should be used. It is also doubtful whether raising the foot of the bed on blocks does any good after fifteen minutes of having the patient in a head-down position; in fact, by causing cerebral congestion it may and probably does do more harm than good, as well as being most uncomfortable for the patient.

Even though apparently as much blood as has been lost during operation is replaced at the time of loss, a slow drip transfusion of half a litre of blood is given during the twenty-four hours after operation.

On return to the ward the patient appears comfortable, and is awake and able to speak clearly of his feelings and discuss the operation. The blood pressure is usually around normal at this time, but over the next four hours a steady drop has been general throughout the series; hence the slow drip transfusion of blood, which does control it to a satisfactory degree. Pain is not manifest until from six to eight hours after the induction of the epidural anæsthesia. Pain and distress are found to be much less in the two or three days after such an insult to the body, under these conditions. This allows more breathing exercises and greater movement to take place, as well as easier nursing.

Discussion.

Many of the older workers in medicine, such as Crile and Cannon, were keen observers, and, although they may not have presented the whole picture in many of their works, nevertheless there was something to their theories and observations. Crile's main theory on shock suggested that the continued nervous impulses, to which the central nervous system is subjected by trauma, brought about the syndrome of shock. Cannon suggested that it was the overaction of the suprarenals that produced shock. Recently Lobarit and Hugenaud (1951) stated that in certain circumstances, after a great insult to the body, death might result from overaction of the autonomic nervous system, which is responsible for and is attempting to maintain a *status quo* of the body's cellular environment.

It is suggested that, by the bringing about of this nervous isolation of the part undergoing operation, the remaining organs are not subjected to such a nervous insult. The various systems of the body are then not required to respond to such a degree that the smooth running of the body is disturbed. Certainly over-compensation does not take place. Further, the post-operative period is freed of pain and side-effects; this could possibly be through the lack of facilitation in the nervous system due to the decreased number of impulses that ascend the central nervous system during operation. It is possible also that such an isolation decreases the degree of the metabolic response to trauma, which is probably the killing factor in gigantic surgery.

By this blocking mechanism, the power of the body to respond to blood loss by vasoconstriction of various organs is paralysed. For this reason, and to maintain an adequate oxygen supply to the tissues, it is imperative to replace the blood lost no matter how small the amount may be, and an intravenous drip transfusion is always set up before this procedure is embarked on. The intravenous drip transfusion also allows the easy immediate treatment of the two feared side-effects—namely, the introduction of noradrenaline in the case of complete vasomotor collapse and of thiopentone if convulsions should occur. Noradrenaline (two cubic centimetres of a 0·1% solution in 0·5 litre) is selected because it should be the true antidote to such a peripheral vasomotor collapse. It is a true vasoconstrictor as against methadrine or ephedrine, both of which are vasopressor drugs and act mainly by increasing the cardiac output.

The decrease in general oozing and hæmorrhage from small vessels under such a block is most pronounced. The reason for this is not quite clear. It certainly is not due to the fall in blood pressure, which is usually present but by no means always so, and not always to such a degree that it would affect the picture. The decrease in hæmorrhage which is seen in operations on the hand under brachial plexus blocks also shows that it is not the fall in blood pressure that is responsible for this decrease. It is possible that part of the power to bleed after insult to the body is reflex in action, not only through a local axon reflex, but through a wider spinal reflex, which is abolished by the epidural or brachial plexus block. Thus the vasodilatation, which is one of the normal reflex responses of the body to trauma, is decreased.

Reactionary hæmorrhages have not occurred in this series; actually the blood pressure has been practically back to normal at the completion of operation in nearly all the cases.

The question as to whether the *dura mater* is permeable to the local anæsthetic agent appears not to have been definitely settled. In practice it has been found not to enter the subarachnoid space and give a total spinal block; but Fremin (1952) has recovered a significant amount of local anæsthetic agent from the cerebro-spinal fluid after many epidural blocks. In none of these series has there been a suggestion of a total spinal block. Should a total spinal block occur with complete paralysis of the body and possibly with vasomotor collapse, all facilities should be at hand to carry out intubation and "breathe" the patient until the paralysis has worn off and the patient has adequate power back again.

The number and height of segments affected vary, not only with the amount of head-down posture and the amount of local anæsthetic agent injected, but also with the size of the intervertebral openings around the nerve. These openings vary in size according to the amount of fibrous tissue that is present.

If the head-down position is not used, analgesia and relaxation are present to the nipple line, often with very little fall of blood pressure. With the tilted position, the level of analgesia rises to include the fifth cervical nerve. This produces a fall of blood pressure to a systolic pressure of about 60 millimetres of mercury. In such cases there is some slight weakening of the hand grip, but apparently no decrease in chest movement, as the patient has no difficulty in taking a quick deep breath, and no paradoxical chest movement is noticed with such a breath. This property of relaxation without paralysis is the one great advantage that this method has over the use of curare. If perception and especially pain perception is interrupted from a muscle, adequate relaxation follows; there is no need to produce complete pharmacological section or interruption of the motor nerve supplying the muscle to bring about full relaxation. The strength of the solution is the

determining factor, together with the thickness and myelination of the nerve fibre as to which specific impulse is affected. This produces the set scale of loss of function from sympathetic fibres at the susceptible end of the scale, up through heat and cold, pain and touch sensation, and lastly motor paralysis, when a 1·5% solution of "Xylocaine" is used.

Theoretically, a partial failure of this type of anæsthesia should be dangerous, as the affected segments are not able to help compensate shock and blood loss by virtue of the paralysis of their sympathetic supply. Thus the remaining unaffected part of the body is left to carry the full load of response by vasoconstriction for the whole body. There has been one case of patchy analgesia and relaxation in this series. Full general anæsthesia was necessary together with a transfusion of three litres of blood during the operative period.

High spinal anæsthesia, of course, gives a similar picture and result as an epidural block. The anæsthetists of the last decade all remark how well major operations progressed under spinal anæsthesia, and stress the lack of shock and excellent conditions for the surgeon. However, introducing the local anæsthetic agent into the epidural instead of the subarachnoid space has the following advantages:

1. It is a peripheral nerve block procedure and thus carries no risk of damage to the anterior horn cells or spinal cord; therefore neurological complications are absent.

2. There is no risk of post-operative headache.

3. The upper limit of distribution is more easily controlled.

4. Relaxation without motor paralysis is more easily obtained.

Whatever attractive picture is presented by epidural analgesia, there are four grave disadvantages to the procedure, as follows:

1. It is technically difficult and time-consuming to induce.

2. There is a great danger of producing a large hole in the *dura mater* with the large-bore Tuohy needle, as well as the other possible complications of vasomotor collapse and convulsions.

3. The large number of venous blood vessels in this space makes a peridural hæmatoma a possible danger.

4. A relatively large amount of local anæsthetic agent is necessary.

Conclusion.

This technique of epidural block presents a bloodless field with excellent relaxation to the surgeon. It greatly reduces the amount of blood loss and the degree of shock.

The indications are very limited; but when surgical procedures on a very large scale are contemplated it provides almost ideal conditions for the surgeon, and offers the patient the most safe and most comfortable period after operation.

Acknowledgements.

My thanks are due to Dr. Norman James, Director of Anæsthesia of the Royal Melbourne Hospital, for allowing me every facility to study this method of anæsthesia.

OVERHEATING OF THE ANÆSTHETIZED PATIENT.[1]

By MARY BURNELL,
Adelaide.

WERE ideal operating theatre conditions usual in Australia, this paper would be unnecessary. As it is, however, control of temperature by air-conditioning is very unusual in our country. The common arrangement is one of close proximity of operating-room and sterilizing facilities, which results in high temperature and humidity during many months of the long hot summer. Over many years, the outmoded idea of heating the patient suffering from shock has led to over-clothing of the anæsthetized patient, and to insufficient care in protecting him from excessive draping during operation, so that his heat loss has been considerably hindered. The effects are enhanced in children, on account of their high basal metabolic rate, their relative deficiency of surface area for cooling, and their unstable heat control mechanism.

During this last summer, an unusually cool one, for a period of three months a simple investigation of the temperatures of anæsthetized children was carried out at the Adelaide Children's Hospital, in two operating theatres. Rectal temperatures before and after anæsthesia, the room temperature, and the duration and nature of the operation were recorded, and the results were as follows.

1. One theatre has a cooling plant, which is moderately effective in controlling temperature, but not humidity. Nose and throat and ophthalmic operations are performed there; most of the operations are of short duration, and are performed on healthier subjects than in the general surgical theatres. Few of the children showed any significant rise of temperature while under anæsthesia. Those who did were the few who underwent longer operations, such as the radical operation for mastoid infection.

2. In the main theatre, where general surgery is conducted, no cooling plant is practicable, and the room temperature here soon rises, even in moderately hot weather. The patients showed a rise of temperature, in nearly every case, when the theatre temperature reached 80° F. or more; many showed a rise at room temperature below this; febrile children almost always had a rise of temperature, even during quite short operations; and the longer the operation, the greater was the rise.

The effects of rise of temperature under anæsthesia are excessive sweating, with loss of water and electrolytes (probably very undesirable) and tachypnœa and tachycardia, especially in the small child, which are very exhausting, and increase the rising metabolic rate; this leads to an additional oxygen requirement. If unsatisfied, this may lead to convulsions under anæsthesia, a dangerous complication.

The following illustrative case history was supplied by a resident medical officer:

A child, aged two years and three months, was submitted to operation for intussusception. He had an associated tonsillitis and his temperature was 100° F. before anæsthesia. The air temperature that evening was 83° F. Premedication was with atropine sulphate, one two-hundredth of a grain, given subcutaneously. Operation was successful and lasted nearly two hours. Induction of anæsthesia was normal, ether anæsthesia ("open" method) being used. During maintenance, the anæsthetist noted a pulse of bounding character at a rate of over 200 per minute, a flushed skin, and a rising temperature, which did not apparently cause concern. Towards the end of the operation, when the administration of the anæsthetic agent had been discontinued, the patient had a severe convulsive seizure, accompanied by moderate cyanosis. The axillary temperature was found to be over 105° F. Oxygen was administered and vigorous efforts towards cooling the patient were made. Over the next seven hours his temperature gradually fell to normal and did not subsequently rise. He had no further convulsions, and made a good recovery.

Careful management may modify such effects, even when operating conditions are hot and humid, and is necessary even in properly cooled operating theatres.

1. Clothing should be minimal and of thin cotton material.

2. Drapes should be so applied as to allow maximum heat loss, and preferably raised clear of the patient by anæsthetic screens, cradles or instrument tables; air may be circulated beneath these by fans. In very hot conditions, we have even draped the naked small patients in wet sterile sheets. If possible, rubber and plastic drapes should not be used at all.

3. Hyoscine or atropine premedication should be used with caution, especially in febrile or dehydrated children,

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

for whom these drugs may be omitted altogether. Atropine raises the metabolic rate, and both drugs hinder heat loss by inhibiting sweating. Children are tolerant of atropine, but there is nothing to show that they are resistant to it. During ether anæsthesia, excessive salivation and respiratory tract secretions may be due to no more than a crying induction, and will not be prevented by increasing the dosage—a practice which at the best is cruel, at the worst may be dangerous in conditions of fever, serious illness, long operations and high external temperature.

4. The anæsthetic technique should be considered carefully for the contribution it may make to heat retention. It should be remembered that the child exposed to the dangers of rising body temperature under anæsthesia has an increased oxygen requirement, so that extra oxygen should always be administered. When gaseous and more complicated anæsthetics are given, high flow-rates of gases to remove carbon dioxide should be used, rather than carbon dioxide absorption and rebreathing techniques. Although the use of thiopentone and the relaxing agents is probably some protection against the occurrence of actual convulsions, the other dangers of overheating the anæsthetized patient are still present, and he should be just as carefully protected from them as when simple open methods of anæsthesia are used.

Reports of Cases.

UNILATERAL BRACHIAL PARALYSIS AFTER ANÆSTHESIA WITH THIOPENTONE, "FLAXEDIL" AND NITROUS OXIDE.[1]

By WINIFRED WALL,
Adelaide.

THE operation in the case about to be reported was a total hysterectomy for very large fibromyomata, in a *nullipara*, aged forty-five years, weighing 15·5 stone. It was a long, difficult operation for the surgeon, with the patient in a steep Trendelenburg position for two hours. The left arm was used for intravenous injections which were given through two separate syringes, one in the antecubital fossa and one at the wrist. It was before the days of "Gordh" needles and the like. The arm was kept abducted at less than a right angle and its position was checked from time to time. The shoulder supports were made all in one piece, with rigid shoulder rests at the inner ends. The heavy body weight was supported by the legs bent slightly at the knees, and by the well-padded shoulder pieces. In this position the weight of the body tended to sag downwards through the shoulder pieces, and this sagging was made worse by my traction on the jaw in order to maintain a good airway.

On awakening from the anæsthesia, the patient found that her left arm was limp and helpless. There was a good deal of aching pain, and very little movement except a slight amount in the hand. Although there was a considerable improvement in muscle power before she left hospital at the end of three weeks, it was quite six months before recovery was complete.

In this case I consider that the paralysis was undoubtedly due to traction on the brachial plexus, with some compression as well, caused by the drag through the rigid shoulder pieces, and by my pulling on the jaw and head. It could have been avoided by the following measures: (i) flexion of the elbow with use of the veins on the back of the hand, and less abduction of the arm; (ii) use of an endotracheal tube to avoid traction of the head; (iii) elevation of the head; (iv) lessening of the period of the Trendelenburg tilt to the minimum required by the surgeon.

[1] Read at the annual meeting of the Australian Society of Anæsthetists, Perth, April 26 to 29, 1954.

I know that there has been a number of other cases of brachial paralysis in South Australia over the last few years. Four have been reported to me by surgical colleagues. One was a case very similar to mine—namely, a hysterectomy on an obese woman, a steep Trendelenburg tilt, a long operation, the use of relaxing agents, and an abducted arm. Complete recovery took nine months. The second case was one of bilateral severe paralysis in a trained nurse who had undergone a simple mastectomy. There is no record of the type of anæsthesia used, but the surgeon thinks that it was gas anæsthesia, and that no relaxing agent was used. The arms were abducted simultaneously to a right angle in the "crucifix" position. In this case recovery took about nine months. The third case was a milder one. A wrist drop followed a Millin's prostatectomy, the anæsthetic sequence being thiopentone, a relaxing agent and nitrous oxide. The last case occurred only a short time ago. The patient underwent a partial gastrectomy. Here the arm was abducted, and was pushed on by the several onlookers and assistants. There is fairly severe paralysis of the arm, with less effect on the forearm and hand.

A comprehensive survey of this whole subject has been given by Ewing (1953). I think there is no doubt that most of the brachial plexus injuries following anæsthesia are preventible, and they would not happen if the anæsthetist and the surgeon were keenly alive to the possibility of these injuries.

At the Royal Adelaide Hospital it is a routine procedure for the patient to have an arm binder which encloses one arm and folds over the other and goes under the mattress. I also use small arm boards made out of three-ply wood and unpadded. These can be slipped in under the mattress quite easily, and they can take the weight of the arms when the elbows are flexed. Rubber pads can be adjusted as required. Their use prevents any heavy pressure on the chest, and yet they do not get in the way of the surgeon.

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A CASE OF HÆMORRHAGE INTO THE INTERNAL OBLIQUE MUSCLE SIMULATING AN INCARCERATED INDIRECT INGUINAL HERNIA.

By BRUCE MCK. ROBERTSON,
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THE literature gives references to rupture of the *rectus abdominis* muscle (Trafford, 1951; Körner, 1951; Muziarelli, 1951); but a cursory search has not revealed a case of hæmorrhage into the internal oblique muscle.

The following case is reported because of this, and because it closely simulated an incarcerated inguinal hernia.

Clinical Record.

The patient, Mr. X, aged forty-five years, presented at the out-patient department on November 27, 1953. He gave a history of having slipped and fallen on a cane stump at work. He noticed pain in the left groin, which caused nausea, and the immediate appearance of a tender lump in the left groin. He was admitted to the surgical ward.

On examination the patient was found to be a healthy male, who complained of pain in the left groin on movement. The cardio-vascular, respiratory and central nervous systems were normal to examination. There was a tense, tender and irreducible lump about the size of a small egg in the left inguinal region. There was some bruising of the scrotum. A diagnosis of incarcerated left indirect inguinal hernia was made.

Treatment was conservative in the first instance. A warm bath, followed by a subcutaneous injection of one-sixth of a grain of morphine, was given and the patient

was kept in the head-down position. A half-hourly pulse record was kept.

The patient's condition remained good. He was in no pain, except on movement, and his pulse rate was steady between the limits of 60 to 70 per minute. He now had no nausea, and he had not vomited. However, the lump was still tense, tender and irreducible, and in spite of his satisfactory clinical condition operation was advised and accepted on November 28.

At operation the standard inguinal incision was made. Immediately the skin was divided the subcutaneous tissues were seen to be infiltrated with blood. When the external oblique aponeurosis was divided, a mass of black tissue, resembling gangrenous gut, was seen lying superior, and medial to, a structure resembling the cord. Further dissection, however, revealed that the "gangrenous gut" was in fact a hæmatoma in the substance of the internal oblique, and the "cord" was a portion of the free edge of the internal oblique which had been separated from the main muscle mass by the hæmorrhage. Further dissection proved that the cord and deep inguinal ring were intact and that no hernia was present. The clot was evacuated and, as no bleeding point could be found, the incision was closed. Convalescence was uneventful and the patient was discharged from hospital on December 12. He returned to work on January 12, 1954.

Summary.

A case of traumatic hæmorrhage into the internal oblique muscle simulating an incarcerated indirect inguinal hernia is described.

Acknowledgement.

My thanks are due to the Director-General of Health and Medical Services, Queensland, for permission to publish this case record.

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ACUTE VOLVULUS OF THE STOMACH.

By N. G. YORK,

Senior House Surgeon, Royal Melbourne Hospital, Melbourne.

ACUTE VOLVULUS of the stomach was first described by Berti in 1866 and for the first time successfully operated on by Berg in 1896.

Buchanan (1930) produced an excellent review of the 34 cases then published, and more recently Dalgaard (1952) has collected about 100 acute cases from the literature. In the annals of this hospital only one previous case is on record (Hailes, 1923).

Clinical Record.

X., aged sixty-three years, a war widow, was admitted to the Royal Melbourne Hospital at 10.40 p.m. on February 10, 1953, with a provisional diagnosis of "perforated carcinoma of the stomach". She stated that she had been well until three years previously, when she began to suffer attacks of severe, sharp, epigastric pain, which usually commenced during a meal, became worse after it, persisted all day, but became dull towards evening and never occurred at night. The pain did not radiate. Each attack was associated with vomiting of a copious amount of dark chocolate-coloured fluid—"pints of it"—and on one occasion this fluid contained dark blood. Attacks were infrequent until six months before her admission to hospital, when the free intervals decreased and the pain and vomiting increased in severity and duration, lasting four to five days each time.

Appetite and digestion were excellent between attacks, but she had lost two stone in weight in twenty months.

On her admission to hospital, the patient said that she was having the worst attack of all, and that this had commenced three days previously. The vomiting had been copious at first, but the vomitus had become scanty, straw-coloured and watery, and the abdomen had become greatly enlarged over the preceding two days.

On examination, the patient had obviously lost weight. She was retching continually and in severe pain. Her temperature was 97° F., her pulse rate was 100 per minute and her blood pressure was 160 millimetres of mercury, systolic, and 115 millimetres, diastolic. The tongue was moist but not furred, and the breath was not typically "abdominal". The abdomen was tender all over, this tenderness being most pronounced in the epigastrium, where a large, firm, smooth, globular mass, eight to ten inches in diameter, was readily palpable, extending down to the umbilicus and disappearing beneath the costal margins. There was no rectal tenderness.

Intravenous therapy was commenced and an unsuccessful attempt was made to pass a gastric tube. Immediate operation was advised.

At operation, performed by Dr. Graham Mackenzie, the peritoneum was opened through an upper mid-line incision, and immediately the mass presented, covered by a taut, attenuated layer of omentum. This was incised to expose a large plum-coloured cyst with dilated, tortuous veins coursing over its surface. It was identified as an enormously dilated stomach, and the omentum proved to be transverse mesocolon, attached superiorly to the greater curve, which had rotated anteriorly through 180° and now lay below the liver. The lesser curve occupied the normal position of the greater, while the transverse colon had been displaced upwards by the taut mesocolon. In this case the rotation had caused strangulation of most of the stomach wall. The stomach was aspirated, a trochar and cannula being used, and the defect in the paper-thin wall was oversewn, though with difficulty because of its extreme friability. The stomach was untwisted and a gastric tube inserted by the anæsthetist. At this stage, as the patient's systolic blood pressure had fallen to 80 millimetres of mercury and the pulse was barely palpable despite resuscitation, the wound was rapidly closed, with drainage.

After the operation the patient became grossly irrational and developed bronchopneumonia, auricular fibrillation and a paralytic ileus which required continuous aspiration and intravenous therapy for nine days. Return of bowel function was followed by the appearance of a gastric fistula, which, however, had almost closed when the patient was discharged from hospital three weeks after operation.

The follow-up examination has extended over a period of seventeen months, during which she has had no dyspepsia and no recurrence of symptoms, looks and feels well and has gained three stone in weight. Repeated X-ray examinations with an opaque meal have failed to reveal any abnormality in position or outline of the stomach or duodenum, and diaphragmatic anomalies have not been demonstrated.

Morbid Anatomy.

The stomach is normally fixed by the œsophagus and the gastro-phrenic ligaments above, and by the peritoneum covering the second portion of the duodenum below.

Volvulus will occur in relation to a line joining these two fixed points—the "cardio-pyloric" line; but it would seem to require unusually long gastro-hepatic and gastro-colic mesenteries to allow of its occurrence.

Recorded cases fall into two groups, for which von Haberer has suggested the cumbrous but expressive terms "mesentero-axial" and "organo-axial" volvulus. In the former (comparable with volvulus of the sigmoid colon), the viscus pivots around a taut mesentery, the lesser

omentum, and the pylorus travels to the left in front of the fundus, twisting the stomach on an axis which is at right angles to the cardio-pyloric line. In the organo-axial type, the stomach rolls around the cardio-pyloric line in a manner similar to "a log of wood floating in water and rolling on its own long axis" (Hill and Paul, 1939).

In addition, cases may be subdivided according to extent (total or partial volvulus), direction (anterior or posterior rotation), and severity (acute, intermittent, or chronic).

Pathogenesis.

Maingot (1953) observes that the majority of cases of total gastric volvulus are not, in fact, associated with any pathological change in the stomach or adjacent structures, although in many cases a considerable degree of visceroptosis has been found, both at operation and at autopsy.

In contrast, most cases of partial or chronic volvulus have been associated with gastric ulcer, neoplasm, perigastritis, eventration of the diaphragm, diaphragmatic hernia, megacolon, or severe colonic distension due to chronic constipation and the like.

Comment.

The three constant clinical findings in acute gastric volvulus are the following; (i) early vomiting, followed by intractable retching and inability to vomit; (ii) rapidly increasing distension of the upper part of the abdomen, whilst the lower part remains flat and retracted; (iii) inability to secure the passage of a stomach tube.

The condition carries a very heavy mortality rate (over 50%), and hence demands urgent surgical interference. This is best limited to aspiration of the stomach, untwisting of the volvulus and, when possible, oversewing of any doubtful necrotic areas in the wall.

Gastropexy, if indicated, may well be performed at a later date.

The case described illustrates the features of an acute total "organo-axial" volvulus of the stomach, which occurred after a three-year history of intermittent attacks, which were almost certainly of the same nature but which underwent spontaneous resolution. It also demonstrates the great degree of recovery which is possible in this site after restoration of blood supply to an apparently non-viable viscus.

Acknowledgement.

My thanks are due to Dr. Grayton Brown, under whose care the patient was admitted to hospital, for permission to publish this report.

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Reviews.

The Year Book of Endocrinology (1953-1954 Year Book Series). Edited by Gilbert S. Gordan, M.D., Ph.D.; 1954. Chicago: The Year Book Publishers, Incorporated. 8" × 5¼", pp. 390, with 99 illustrations. Price: $6.00.

The most notable individual feature of this particular Year Book is the brief editorial introduction to each of the main sections. In this are summarized recent advances in and the present status of knowledge of the particular aspect of endocrinology dealt with. The section on the pituitary gland is subdivided in relation to the adenohypophysis and to the neurohypophysis and water metabolism. Subjects in the section on the thyroid gland include hypothyroidism, hyperthyroidism, exophthalmos and thyroiditis and cancer. In the section on the parathyroids and calcium metabolism are included hyperparathyroidism, hypoparathyroidism, osteomalacia and hypercalcæmia. The adrenal medulla is dealt with in a special article by G. W. Kliman, as well as in a selection of abstracts. Subsections of the section on the adrenal cortex are devoted to salt and water metabolism, steroid metabolism, protein metabolism, Addison's disease, Cushing's disease and Cushing's syndrome, and adrenal virilism. Intersexuality has a section to itself. Subjects considered in the section on the female reproductive system are ovarian agenesis, premenstrual tension and dysmenorrhœa, hormone-producing, œstrogen-producing and virilizing tumours of the ovary, hirsutism and virilism without tumour, œstrogens, hormone treatment of habitual abortion and progesterone. In the section on the testis are subsections on sexual precocity, hypogonadism, aging and androgenic production, and androgenic and anabolic steroids. Concluding sections deal with carbohydrate metabolism and *diabetes mellitus*, and with endocrine treatment of neoplastic diseases. Most members of the medical profession will have an interest in this survey of recent literature in a field of particular current importance.

Clinical Neurology. By Bernard J. Alpers, M.D., Sc.D. (Med.); Third Edition; 1954. Philadelphia: F. A. Davis Company. Sydney: Angus and Robertson, Limited. 10" × 7¼", pp. 896, with 243 illustrations. Price: £5 2s. 3d.

This is a text-book written on conventional lines for medical students and general practitioners. As the author decided to include rare syndromes, readers who are not specializing in neurology may find the work somewhat overwhelming. In this third edition the sections on poliomyelitis, meningitis, encephalitis, epilepsy, neurosyphilis and cerebral aneurysm have undergone extensive revision. In the first chapter, on examination of the nervous system, the personality study (after Strecker and Appel) set out in a table serves as a useful reminder to those who have had a fair grounding in psychiatric investigation. In the chapter on neuritis and neuralgias the author lists some fifteen synonyms of acute infective polyneuritis including the Guillain-Barré syndrome. In the sixth chapter, on diseases of the spinal cord, there is no mention of cervical spondylosis, which has recently been prominent in British neurological literature, although sections are devoted to spondylitis and hypertrophic arthritis. On page 439 the figure of 5,000,000 units of penicillin is clearly an error for 500,000. Cerebral aneurysm is stated to be arteriosclerotic in origin in 49% of cases. Professor Alpers finds the results of injection of the stellate ganglion with procaine "not encouraging" in the treatment of cerebral thrombosis. He also regards *dl*-glutamic acid as of questionable value in the treatment of *petit mal* seizures. The final chapters are devoted to the vegetative nervous system and endocrine disorders, degenerative (cerebral) diseases, congenital and developmental disorders and diseases of the skull and vertebræ. Benign frontal hyperostosis is surely a euphemism for a condition with progressive symptoms. The matter throughout has been set out concisely and clearly, and some 59 tables of symptoms and differential diagnoses will be appreciated by the student. Two hundred and thirty illustrations, many of them occupying a whole page, are of uniformly high standard. The book is commended to the advanced student and the candidate for higher degrees and diplomas, and the practising neurologist will find it valuable for the purpose of reference.

Notes on Books, Current Journals and New Appliances.

Family Doctor. Published monthly by the proprietors, the British Medical Association, Tavistock Square, London, E.C.1. Sole agents for Australia and New Zealand, Gordon and Gotch (Australia), Limited. Subscription for twelve months: 20s. (sterling), including postage.

September's *Family Doctor* features a special school section with articles about the first day at school, play centres, school uniforms, infectious diseases in relation to school and the relationship of parents to their children's schools. Although some details in these articles apply to England, most of the subject matter is of general interest. Other articles deal with poliomyelitis and what can be done about it, hormone creams, science and the sea, heredity and the blood and a bunch of other interesting things. The general production is as attractive as ever.

The Medical Journal of Australia

SATURDAY, OCTOBER 23, 1954.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of the article. The abbreviations used for the titles of journals are those adopted by the Quarterly Cumulative Index Medicus. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

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THE PROBLEMS OF AN AGING COMMUNITY.

THE problem presented by the old people in the community has many facets. One or more of these facets has been discussed on no less than eight occasions in these columns during the last ten years. It is inevitable that it should come up for discussion from time to time. The problem is widespread and attempts have been made to find a solution to some of the difficulties in Great Britain and America as well as in Australia. We all know that the percentage of old people in the community is gradually increasing. This is one of the reasons why the problem is discussed from time to time. Another is that every member of the community may in the long run be personally interested in the question. The recent census which has been taken in Australia will without doubt yield much interesting information about this. J. M. Mackintosh, in a recent article entitled "The Threshold of Age"[1] has shown that in 1891 people over the age of 65 formed 5% of the population in the United Kingdom, and that in 1951 the figure was 11%. He estimates that by 1980 one-fifth of the persons in the United Kingdom will be of pensionable age. The appearance of Mackintosh's paper is one reason for the present discussion. The other is provided by an article from the pen of J. H. Sheldon, senior physician to the Royal Hospital, Wolverhampton, who writes on "The Social Philosophy of Old Age".[2] His paper was the presidential address to the third congress of the International Association of Gerontology held in London in July, 1954. Sheldon gives two reasons for the increase in the aging population. The first is the decline in birth rates from 1870 onwards, which has caused the classical bulge in the population pyramid, and the other is the steady decline in mortality rates, which by lessening the normal processes of denudation allows an increasing number of survivors from the earlier age period to join the "old age cohorts". He describes as an exaggeration the popular belief that the success of modern therapeutics dealing with bacterial infection has itself caused the whole problem by a process picturesquely described as "medicated survival". There has been a great increase in the expectation of life in the modern world applicable to all ages, and the old people have the least share in this increase. Sheldon describes two dangers. The first would, in his opinion, be a change in the internal structure of the old age population characterized by an increase in the proportion living beyond the age of 75 years. He thinks that, broadly speaking, the quinquennium from 70 to 75 marks a dividing point in human life. Before this quinquennium the majority of people are potential donors; after it they tend to become debtors to the common effort. It is clear that an increase in the proportion reaching extreme old age would inevitably cast a disproportionate burden on the health of the community and on its nursing and domestic resources. The second danger seen by him concerns what he calls "the average duration of final incapacity"—the ultimate period of life during which an individual may require total carriage by the younger members of the community. It will, he states, be difficult enough to cope in twenty years' time with a 50% increase in old people whose average duration of incapacity is the same as now; it would probably be impossible to deal with a situation in which the increase in total numbers was accompanied by an increased duration of incapacity. Sheldon points out that the replacement of acute infections by slower terminal processes suggests that this may be actually happening now. The hope must be that the growth in numbers will be accompanied by an increase in general stamina.

The question then arises of how the vigour of those who are growing old may be maintained. Clearly, it should be possible for old people to make some contribution to the common effort of the community and also to maintain their domestic independence for as long as possible. We have on more than one occasion denounced the custom by which an employee engaged in physical or mental activity is compelled to retire at a certain age. We know that many men who are forced to retire from employment on reaching the age of sixty or sixty-five years are still capable of doing useful work. They may not, perhaps, be able to work with their previous vim and vigour; a certain slowing up may take place, but they are still able and very often anxious to continue to do some kind of work. This was shown very clearly a few weeks ago, when a leading solicitor in one of the capital cities of Australia sought to obtain the services of a youth whose duty it would be to carry out certain routine procedures connected with a lawyer's office. In spite of several carefully worded advertisements, no applications were received. Recourse was then had to the expedient of advertising for a man who had retired from previous employment, and in no time more than 80 applications had been received. The applicants were men who had held important posts in the community, such as bank managers, secretaries of large and important societies, executive officers of various kinds, and other people who had been used to handling

[1] *Lancet*, May 15, 1954.
[2] *Lancet*, July 24, 1954.

important and responsible work. If we assume for the moment that work will be available for men who have passed the age of sixty or sixty-five years, we may turn to what Sheldon has to say about the maintenance of vigour in these persons. Sheldon's experience of old people before and after the inception of the National Health Service in Great Britain leads him to say without hesitation that the provision of suitable spectacles is far and away the most important single thing that can be done to maintain the useful activity of old people. He states that more than 90% of old people required spectacles, and that no less than one-third of them had previously been using glasses which varied through all stages of defect, from the relatively useless to the positively harmful. A great deal has been written about the enormous demand which was made under provisions of the National Health Service in Great Britain for spectacles. Sheldon thinks that the demand for spectacles substantiated the reality of the need. Second in importance, in his opinion, is the alleviation by hearing aids of the decline in auditory acuity which so often accompanies the aging process. He declares that the argument for the provision of these aids to perception becomes all the stronger when we remember that cerebral mechanisms in old people require a greater sensory input than in youth. Third in importance is, in his opinion, attention to the feet of old persons. To him, one of the most infuriating sights seen in old people at home is that of the woman whose physical activity is severely limited by painful deformity of the feet. The remedy here, of course, lies more in prevention than in cure. The campaign for the use of suitable footwear from the early days of childhood should be backed by the health authorities, the school authorities and general medical practitioners. Sheldon writes: "A country whose old people possess satisfactory sight and hearing, and can walk on sound feet will have an old-age population able to contribute immensely more to the commonweal than would otherwise be the case." In Great Britain, women attain official old age at sixty years and men at sixty-five, and Sheldon points out that there is a gap between the times of onset of statutory and natural old age. No ordinary community, he declares, can face the future with equanimity if everybody on the attainment of a certain fixed age enters what has been called "a functionless interregnum lasting till death", during which they are nevertheless subsidized to draw on the common level of production. Sheldon naturally confines his discussion to problems associated with gerontology. He refers to three "disciplines" which are involved. The first has to do with what has already been mentioned, that men are forced to retire at a certain age and that many of them do not wish to do so. If a man is to work after the age of sixty-five years, the type of work which he may be able to do opens up a large field for argument. Mackintosh, in his paper, sets out the essentials of a good retirement job as follows:

(1) The job should be paid.

(2) The job should be on a part-time basis (becoming, if possible, gradually less onerous with increasing years) or should be lighter in the sense of relieving physical strain or, what is more important, slowing the pace.

(3) The job should be on a mental level not substantially less than his previous work. We do not wish to draft thousands of intelligent workmen to inferior duties which give them no real satisfaction. A job should be such as to offer interest and stimulation and avoid monotony.

(4) The worker should be prepared to cooperate in simple and effective tests of his mental and physical capacity and, if necessary, undergo a course of training for new employment.

Mackintosh states, quite rightly, that the selection of an elderly man for his new job should be based on his positive capacities and not on a list of his disabilities. The second of the "disciplines" mentioned by Sheldon has to do with technical problems. Here some responsibility may be carried by the medical practitioner. He may be called upon to express an opinion on the type of occupation suitable for or harmful to older people, and he may have to help to select from suitable alternatives something which the person will be able to carry out. The choice will often depend on the mental outlook of the person concerned. As has been so often stated in these columns, a man who is looking forward to retirement is foolish if he has cultivated no reserves in himself on which he can fall back—reserves apart from his work. There comes to mind one man who was gifted with imagination and also a well-stocked and versatile mind. On his retirement he told a friend that if he had known what fun it was to be able to do just what he liked, he would have retired long before he was compelled to by his reaching the age limit. If a man is provided with a suitable pension, he need not necessarily have a job for which he receives payment. The essential fact is that his mind shall be kept actively at work and, of course, that his physical condition is treated with reasonable foresight. The third of the "disciplines" mentioned by Sheldon has to do with the field of employment and domestic life. He refers to the employment of women, and particularly married women, in relation to the maintenance of family life and tradition. This is an enormous subject. Here we are concerned only with those women who touch the problems of old age; the most important of these problems is the effect of employment on the availability of domestic help for old people and the relative importance of the two when they are in conflict. He thinks that the time is coming when the domestic and nursing care of the larger numbers of old people of the future will rise to the scale of a major industry and make large demands on the available woman power. Every medical practitioner has seen in his practice examples of domestic situations of the greatest difficulty. We are all familiar with the unfortunate daughter who has to stay at home, or who is made to stay at home, to undertake the care of her aging parents. She often sacrifices herself in every possible way. Her constant company with old people may have a curious effect on her mentality and in all probability she sacrifices all opportunity of marriage and of having a family. This discussion cannot be closed without some mention of what are known as "rest homes", into which old people are sent. These may be satisfactory institutions, well run by conscientious women who have the interests of their charges at heart. On the other hand, all too often they are anything but satisfactory. These rest homes, so-called, should be open to inspection by the public health authorities, and the inspection should be searching and undertaken at irregular intervals and unexpected times. Some of these places, when they have an inmate who is able to afford to pay a reasonable fee, insist on the engagement of "special nurses". These specials are charged up to the patient who can afford to pay, but instead of "specialing" the patient who pays entirely for

their services, they are made or allowed to undertake duties for other patients in the institution. These other patients pay nothing towards the fees of the special nurses—they have to be borne by the one who can afford to pay. This is a dishonest practice. It would be salutary if medical practitioners would inquire into the details of any patient's stay in institutions of this kind. In this matter, as in most matters of human relations, personal affection between members of a family must play a large part. We know that it is love which "binds, supports, and sweetens human life". Love of this kind in a family is mutual. It does not proceed from the child alone or from the parent alone. But that is a question which need not be further pursued at the moment. We must agree with Sheldon's conclusion that the only hopeful and, indeed, realistic way of facing the future is for the community on the one hand and the family and friends on the other to join in an active partnership in the care of their old people. He regards it as quite certain that no matter what the country, neither can manage it quite alone. He is probably right.

Current Comment.

CHLORAMPHENICOL AND BLOOD DYSCRASIAS.

ALTHOUGH it has not been a matter of particular practical concern in this country, a good deal of attention has been paid overseas to the association of blood dyscrasias with the administration of chloramphenicol. In 1952, following on a series of isolated reports, a study was published by C. N. Lewis *et alii* based on a survey from which it seemed apparent that chloramphenicol, on rare occasions and in certain susceptible individuals, caused blood dyscrasias including aplastic anæmia, thrombocytopenic purpura, granulocytopenia and pancytopenia.[1] No light was thrown on the possible mechanism by which such reactions were initiated, and many aspects of the question were left quite unexplained. Nevertheless, as a result of this study and on a recommendation of an *ad hoc* committee of the National Research Council, the following statement was required on the labels of all formulations of chloramphenicol ("Chloromycetin") for systemic use in the United States: "Warning: Blood dyscrasias may be associated with intermittent or prolonged use. It is essential that adequate blood studies be made." As well, the following statement was required in medical literature describing chloramphenicol: "Certain blood dyscrasias (aplastic anemia, thrombocytopenic purpura, granulocytopenia, and pancytopenia) have been associated with the administration of Chloromycetin. It is essential that adequate blood studies be made when prolonged or intermittent administration of this drug is required. Chloromycetin should not be used indiscriminately or for minor infections." In addition, a widespread public publicity campaign was carried out to emphasize the possible dangers with the use of chloramphenicol.

It was anticipated that this publicity and the required warnings in the labelling would be reflected by a reduction in the use of the drug and correspondingly in the number of blood dyscrasias attributed to it. As a matter of fact, according to Henry Welch, C. N. Lewis and I. Kerlan,[2] the quantities of chloramphenicol as certified by the United States Government after August, 1952, did show a precipitous drop. In spite of this, it seemed advisable to make a second survey to determine the number of blood dyscrasias which had developed since the original survey which were associated with the use of chloramphenicol and other drugs as well. This second survey is the subject of Welch, Lewis and Kerlan's paper. A total of 1448 case records were collected and reviewed in the second survey. The cases were widely distributed throughout the United States, but, as would be expected, most of them occurred in areas of greatest population. Welch, Lewis and Kerlan believe that in the study they had the opportunity to examine a substantial proportion of all the dyscrasias which occurred during the period under survey. In each instance, an attempt was made to obtain a complete history of all drugs, chemicals, X-ray therapy and the like, to which the patients had been exposed during the six months preceding the onset of the disorder. By tabulation of these data it was hoped that a causal relationship might be brought out, possibly pointing to drugs which had hitherto been unsuspected as bone marrow depressants.

Unfortunately, for a number of good reasons no statistical inferences can be drawn from the data collected, but the information is none the less of considerable interest. Two points brought out by the survey were, first, that the use of chloramphenicol in the United States was tremendously reduced as a result of the measures introduced in 1952, and, second, that misuse of the drug, which was very noticeable in the first study, appears to have been practically eliminated as judged by the second study. In the analysis of the survey findings, aplastic anæmia, which has a poor prognosis and is the most serious of all the dyscrasias under consideration, received the most careful scrutiny from the standpoint of possible ætiological drug or chemical relationship. There were 26 cases of aplastic anæmia encountered in this second survey in which chloramphenicol was the only known drug used. Of these, in only one case was all the drug administered after August 15, 1952. Six additional patients in the same group received chloramphenicol both before and after August 15, 1952, while the remaining 19 received all the drug before that time. This may reasonably be taken to indicate greater discretion in the use of the drug. An additional 54 cases of aplastic anæmia developed in patients who had received chloramphenicol and another drug or other drugs during approximately the same period of time. Several of these collateral drugs of themselves have been reported as causing various cytopenias, but do not seem to have been suspected of causing aplastic anæmia; examples include such commonly used drugs as aspirin and barbiturates. In another group, the patients had never taken chloramphenicol, or it was administered only after the blood dyscrasia was already well established. It is reasonably certain here that chloramphenicol was in no way involved in the development of the disorder. There were 269 cases of aplastic anæmia in this group, and of these 137 were classified as idiopathic. Welch, Lewis and Kerlan point out that in the final analysis it is conceivable that some of the cases of aplastic anæmia and other dyscrasias which have been attributed to chloramphenicol, or to other drugs for that matter, may represent idiopathic cases and that the association with any drug is mere coincidence. Very few of the patients with a hypoplastic syndrome encountered in either survey actually had a complete blood count just prior to the time when the administration of the suspect drug was started. It cannot be stated categorically that chloramphenicol or any of the other drugs discussed in this report actually caused the blood dyscrasia which developed after their use. The present position appears to be that, even though scientific proof is lacking, the evidence is recognized that chloramphenicol does cause blood dyscrasias in certain susceptible individuals; at the same time, it is clear that blood dyscrasias occur infrequently when chloramphenicol is administered. The position, it must be admitted, still needs a great deal of clarification, but the obscure features are not related merely to chloramphenicol. The whole subject of aplastic anæmia remains difficult.

So far as the paper by Welch, Lewis and Kerlan is concerned, one purpose of their survey was to determine whether or not the warning now required in the labelling of chloramphenicol in the United States was adequate for the safe and effective use of this drug. The National

[1] *Antibiotics & Chemother.*, December, 1952.
[2] *Ibidem*, June, 1954.

Research Council in 1952 apparently felt that it should be, and the survey, in the opinion of these investigators, further supports their judgement. From the information they have gathered, there is every reason to believe that the medical profession has been alerted to the possible hazards involved when this drug is employed, so that the decision to give it in a particular situation rests with the medical practitioner, with whom it properly belongs.

THE HUMAN VOICE.

No one can possibly estimate the importance of the part played by the human voice in the development of mankind and of civilization down the ages. It has been said that the power of speech is what sets man above the lower animals, though in some respects the cynic, looking back upon history and considering the present, may have grounds for wondering whether this is really so. The other function of the human voice is its use in song; it is natural to most human beings to sing, whether ill or well, whether accompanied by the bath-heater or by some more sophisticated instrument. For better or for worse, man has a voice to use, and the factors governing its production are still somewhat controversial; the last word has not been said. In a little book entitled "*La voix*", Édouard Garde sets out the present position succinctly but thoroughly.[1] He is the consultant in phoniatrics at the *Hôpital Boucicaut* and laryngologist to the French radio network. Naturally the book contains all the anatomical and physiological information relating to the larynx and other structures concerned which is necessary to make the subject intelligible to lay readers; over this we may pass, with the comment that it is well set out and satisfactorily illustrated with diagrams. Possibly the most interesting chapter in the book is that in which Garde discusses the tonal classification of voices. It is not possible to deal in detail with the subject in this place, but reference may be made to some of his more striking comments. Garde affirms that, for singers at least, the determination of the correct vocal range is just as important as the determination of the correct blood group is for other people; this no capable teacher of singing and no laryngologist will deny. Garde is satisfied that the most important factor governing the voice is the recurrent laryngeal nerve; the role of the larynx is primarily related to respiration. He describes work done on this nerve, by which its chronaxie was calculated. The difficulty of verifying the result obtained was overcome by measuring the chronaxie of certain peripheral muscles of the face, the throat and the hand after stimulation of their motor nerves. (The subjects, a deep bass and a lyric tenor, were the same in both experiments.) It was considered to have been proved from these calculations and observations that the measured chronaxie of the sterno-cleido-mastoid muscle was the same as the calculated chronaxie of the recurrent laryngeal nerve in the two subjects (who had been chosen because of their extreme types of voice). Further measurements and calculations were carried out on other subjects, and the findings were confirmed. A search for the reason brought the following explanation. The accessory nerve has in the brain a motor nucleus in common with that of the vagus nerve, and the recurrent laryngeal nerve is a branch of the latter. It follows that the accessory nerve (which supplies the sterno-cleido-mastoid muscle) and the recurrent laryngeal nerve have the same chronaxie. The excitability of the recurrent laryngeal nerve is the only factor which determines a person's vocal range. Garde thinks it possible that the excitability of this nerve may vary during the course of the subject's life, particularly as a result of vocal work; more investigation is required. He mentions a study at present in progress on young choristers of the French radio network. Already the results seem to indicate that the degrees of excitability of the vocal chords in children of both sexes from the age of nine years are distributed on the same musical scale as those of adults. This implies that, contrary to the general belief that they are in most respects the same, children's voices can actually be classified as very low, low, medium, high and very high, as can those of adults. Garde points out that in view of this it is unwise to make all children cover the same range in class singing; they should be divided into appropriate groups, and sing within their own range. Such a procedure would eliminate the tiring of children's voices which has been found to occur with the old practice. With regard to adults' voices, Garde shows how by a mathematical formula applied to the measured chronaxie of the sterno-cleido-mastoid muscle it is possible to calculate the note of the highest frequency which the subject can sing after the voice has attained its maximum development; but, as Husson has observed, that fixes the highest note attainable, and not the *tessitura* for regular use. That is a warning that might well be heeded. A well-known Australian laryngologist recently remarked that he was constantly astonished at the small amount of damage done to voices by teachers of singing who knew little or nothing about the mechanism of the voice.

Nothing has been said here of Garde's discussion of other factors (and they are many) influencing the production and character of the human voice; but his account of recent work in France on the chronaxie of the recurrent laryngeal nerve and its importance at least gives food for thought.

[1] "La Voix", by Édouard Garde; 1954. Paris: Presses Universitaires de France. 7" × 5", pp. 128, with 15 text figures.

ACUTE APPENDICITIS IN CHILDREN.

The removal of the inflamed appendix to which the disease process is still confined is an operation which should have no mortality and little morbidity. Consequently, it is a tragedy if death occurs when the inflammatory process has spread beyond the appendix, because this is a death easily preventible by early diagnosis and appendicectomy. Though the mortality of acute appendicitis for the general population is now low, far too many children, especially under the age of five years, still die from this lethal disease. The cause of this does not lie in any difference in the pathology of this disease in children as compared with that of adults, because there is no difference, but it lies in the delay in treatment that occurs at times as a result of difficulties in diagnosis in children and more especially in infants. Nevertheless, even in infants there is always some symptom or sign that draws one's attention to the abdomen to make one suspect intra-abdominal mischief. M. White and W. Dennison[1] in Glasgow found that 60% of their 3000 child patients with acute appendicitis had peritonitis on admission to hospital. This was also the experience of F. Hindmarsh[2] in Newcastle-upon-Tyne; 63 of his 118 patients had peritonitis. In only one in six patients of this latter series was this due to delay on the part of the referring practitioner, but in the others it was due to the failure of the parents to call in medical aid early. Similar experiences befall Australian surgeons, especially those with public hospital experience.

It is not always realized that acute appendicitis is very common in young children and that, as in adults, it often commences with diarrhœa. Thus it is an unfortunate child who develops an attack of acute appendicitis in the practice of a doctor when he is coping with an epidemic of gastro-enteritis, unless that gentleman is particularly astute. Moreover, such occurrences have proved time and time again that acute appendicitis is not amenable to any antibiotics despite the unfortunate teaching of P. Harrison;[3] so that their exhibition does not excuse any delay in operating. Many parents still regard abdominal pains in their young children (or abdominal upsets in tiny babies who cannot discuss their pain) as being due to "gastric" or "bowel" attacks, especially when they are recurrent as when due to a recurring fæcolith appendiceal colic. They still treat these attacks with castor oil or some other of the strong purgatives, none of which should have any place in

[1] *Brit. M. J.*, December 12, 1953.
[2] *Ibidem*, August 14, 1954.
[3] *Am. J. Surg.*, February, 1953.

the treatment of adult human beings, let alone children. Only when the purge has accomplished its fell work of helping to rupture the appendix is medical aid called in. The medical profession is not entirely blameless in this regard. An otherwise eminent practitioner was once heard (with horror) by a colleague to prescribe castor oil for a child with abdominal pain, concluding with the sage remark that if the child had appendicitis the purgative would clinch the diagnosis; presumably peritonitis is easier to diagnose than appendicitis. On the other hand, one enlightened mother refused to give an aperient to her child with abdominal colic, although her doctor had ordered it, as she said that she had heard it was dangerous. Hindmarsh aims to treat all children suffering from acute appendicitis within the first twenty-four hours. This, of course, is not nearly ambitious enough; it should be within six or eight hours at most, and to do this the public should be taught that abdominal pain in children is appendicitis until proved otherwise by the doctor, who should in any case be called in early.

One way of preventing acute appendicitis, which is after all mostly due to obstruction by fæcoliths, is to remove the appendix which is causing recurrent appendicular colic—again common in children—before that attack occurs in which the fæcolith becomes permanently impacted in its lumen, so causing acute appendicitis. It is common to see a child with acute appendicitis rushed to hospital with the prior history that some weeks or months previously he was diagnosed as having appendicular colic; removal of the appendix at that time would have prevented the onset of the more serious pathological process. It is not enough to say that delay is not so dangerous nowadays because of our ancillary aids (gastric suction, intravenous therapy and the antibiotics), for in the late cases we still see wound infections and intraabdominal abscesses, which require more operations and may be followed by later obstructions. Consequently, it should always be taught that no child with an abdominal upset should be given an aperient (aperients may have been correct treatment for gastro-enteritis prior to the days of sulphonamides and the antibiotics, but they are no longer needed); that as soon as an appendix is suspected of being the cause of recurrent abdominal colic, it should be removed forthwith; and that once acute appendicitis is suspected, appendicectomy should be performed within six hours. Not only the profession but also the public should be educated in these teachings.

REHABILITATION.

At the ninth session of the Australasian Medical Congress (British Medical Association) to be held in Sydney in August, 1955, it is intended to devote a plenary session to the subject of rehabilitation. Although the restoration of an injured or ill person as nearly as possible to a normal state of health would seem to be an obvious part of medical and surgical management, it has been surprisingly neglected in the past. Now, however, it is coming into its own and is being studied in its many applications. For this reason, there should be ample material to present in a plenary session of the Congress as well as at the meetings of the special Section of Rehabilitation and Physical Medicine. No doubt, at the meetings of the latter section many more technical aspects of the subject will be discussed, but at the plenary session broad principles should prove sufficient to interest not only the medical members of Congress but the community at large. It is interesting, in this regard, to note that at the thirty-ninth South African Medical Congress, held at Port Elizabeth in June of this year, two plenary sessions were devoted to the subject of rehabilitation, and a diversity of people contributed papers.[1] The opening paper was delivered by C. J. Goedvolk, the medical superintendent of the Chamber of Mines Hospital at Johannesburg, and dealt with the relative responsibilities of commerce, industry and medicine in rehabilitation. This set the stage for the two sessions, as, in fact, members of commerce, industry and medicine all contributed. Industrial aspects of rehabilitation of the handicapped were discussed by the president of the South African Chamber of Industries. The past president of the Association of Chambers of Commerce of South Africa presented the viewpoint of commerce. Some vocational aspects were considered by the Director of Readjustment Services in the Department of Labour, and appropriate members of the medical profession read papers dealing with the approach of physical medicine, psychiatry, orthopædics and medicine (with special reference to rehabilitation by feeding), the hospital point of view, the general practitioner's view, and the particular problem of alcoholism in industry. After a full discussion, a resolution was adopted which, although it does not have to be followed, may well provide a basis for thought on the part of those concerned with the organization and carrying through of the plenary session at our own Congress next year. The resolution was as follows:

That this 39th Medical Congress of the Medical Association of South Africa, having considered the wastage of man-power, the suffering of humanity and the needless expense arising out of the many diverse fields of disablement, commends to the Government the urgency of establishing a National Rehabilitation Council. Amongst others important functions of such a council would be:

(a) To accept the offered co-operation of commerce and industry.

(b) To advise the Minister and existing voluntary bodies in the respective national rehabilitation policy in respect of physically and mentally handicapped to ensure unity of purpose.

(c) To advise on practical ways in which the efforts of both State and voluntary enterprise can be effectively correlated in conformity with the formulation of a national policy referred to in (b).

(d) To advise on gaps in the field of rehabilitation and on ways to bridge such gaps, including executive action by the Council itself to provide the necessary services where these are lacking.

(e) To give attention with the appropriate health and hospital authorities to the health and medical aspects of rehabilitation, whether in the field of Union Government or Provincial departments, to encourage research and sociological service in various fields concerned with the problem of rehabilitation. To respect the autonomy of existing national voluntary bodies and Government departments in this field.

(f) To advise the Minister concerned on legislation in the respective rehabilitation of handicapped persons, more particularly of comprehensive consolidating legislation.

(g) Finally, we pledge the Association in offering technical assistance such as lies within its power in the planning and the working of such a Council.

[1] *South African M.J.*, August 21, 1954.

APPARENTLY SPONTANEOUS DISAPPEARANCE OF *COLON CARCINOMA.*

Spontaneous disappearance of a newgrowth is rather rare, but genuine instances are always worth recording. In a case reported by J. O. Fergeson and B. M. Black,[1] a middle-aged man had a perforated obstructing carcinoma of the descending part of the colon with persistently draining cutaneous sinuses. The mass was solidly fixed to the bony pelvis and judged inoperable. Treatment was given with X rays in moderate dosage. The patient already had a functioning colonic stoma. Almost two years later all evidence of the carcinoma had disappeared, as had a complete segment of the colon distal to the stoma. Biopsy showed no sign of tumour tissue in the blind ends of the colon. Side-to-side colo-colostomy was carried out, and later the stoma was closed with return of bowel function to normal. The patient had regained normal health. Fergeson and Black consider it unlikely that the X-ray therapy was responsible, and suggest that the colonic segment disappeared as a result of infarction and absorption.

[1] *Proc. Staff Meet., Mayo Clin.*, July 28, 1954.

Abstracts from Medical Literature.

GYNÆCOLOGY AND OBSTETRICS.

Post-Menopausal Uterine Bleeding.

J. I. BREWER AND W. H. MILLER (*Am. J. Obst. & Gynec.*, May, 1954) analyse 211 consecutive cases of post-menopausal bleeding. The patients were divided into three groups according to the underlying condition: (i) malignant lesions, (ii) benign lesions, (iii) undetermined causes. The incidence of uterine or adnexal malignant lesions presenting with uterine bleeding was 27·5% (58 patients). The authors state that a single episode of "spotting" for two days, occurring two or three months before the patient is examined, may indicate the presence of carcinoma; three to six months may occur between episodes of bleeding or after a single hæmorrhage. Although the bleeding occurs several months prior to the time the patient reports to her doctor, it must be considered indicative of cancer until proved otherwise. The quantity, duration, and character of the bleeding neither provides a means for distinguishing benign from malignant lesions nor indicates the extent of the cancer. Of the 58 patients with malignant disease, 29 had cancer of the body of the uterus, 24 had cervical carcinoma, four had ovarian and one had tubal cancer. For diagnostic management, curettage of the uterus should always be performed and should be accompanied by curettage of the endocervix and multiple cervical biopsies. In the benign lesion group of 72 patients, polypi (37 cases) were the most common lesions associated with the bleeding. Endometrial hyperplasia (11 cases) and cervical ulcers (10 cases) were the next most common causes. In 81 (38·4%) of the 211 patients, no cause of bleeding could be demonstrated. Twenty patients had had previous irradiation of the uterus for non-malignant causes. Of these, five later developed carcinoma of the uterus—the same percentage as in those who had not been irradiated. The authors conclude that radiation therapy given at a previous date has no effect in altering the frequency of uterine cancer.

Meigs's Syndrome.

J. V. MEIGS (*Am. J. Obst. & Gynec.*, May, 1954) reviews reports up to date of cases of fibroma of the ovary with ascites and hydrothorax—a syndrome which bears his name. Since 1892, 84 such cases have been reported. The author states that to classify a case as falling within the syndrome, four conditions must be fulfilled: (i) The tumour must be a benign and solid tumour with the gross appearance of a fibroma; thecomata and granulosa cell tumours are included in the syndrome. (ii) The tumour must be accompanied by ascites. (iii) There must be fluid in the chest. This is most often found in the right side or both. In some cases the fluid was demonstrated only by X-ray examination or fluoroscopy, but the author suggests retention only of those cases in which the fluid was demonstrated by pleural tap. (iv) Removal of the tumour must relieve the patient of her ascites and chest fluid, and these must not recur. The fluid in the chest has the same composition as the ascitic fluid and probably makes its way into the chest from the abdomen through lymphatic chains or interstices between the cells of the diaphragm. The actual ascitic fluid probably comes from the œdematous fibroma which can leak fluid. The treatment of the syndrome is removal of the tumour, and a cure can be expected.

Urethral Diverticula in the Female.

C. RICHARD, A. GILBERT AND FRANCISCO JOSÉ RIVERA CINTRÓN (*Am. J. Obst. & Gynec.*, March, 1954) report a study of eight patients with urethral diverticula, and discuss the ætiology, location, symptoms, diagnosis and treatment of this condition. They consider that infected urethral diverticula in females are more frequent than is commonly suspected and may be an important disease entity whose diagnosis is prone to be missed. The condition is usually acquired and follows trauma incidental to parturition, instrumentation, calculus or electrocoagulation. The pathology of the sac wall in the cases reported was typically that of a chronic abscess. All patients reported were multigravid, and symptoms were chiefly those resulting from infection of the upper and lower parts of the urinary tract. All but one patient had failed to respond to repeated antibiotic treatment. Seven of the eight patients had a suburethral mass, and all were tender over the anterior vaginal wall. The location and size of the diverticula varied, but the usual site of the ostium is said to be the middle third of the urethra in the mid-line. The authors state that the diagnosis of an infected urethral diverticulum should be considered when infection of the urinary tract fails to respond to or recurs after adequate and appropriate antibiotic therapy. This is particularly significant when lesions of the kidneys, ureters or bladder are excluded in the investigation of persistent pyuria. Dyspareunia is a common symptom and is significant when it follows parturition. When the orifice of the diverticulum is large, the mass may vanish under pressure from the examining finger, and pus and urine may escape from the urethral meatus. Calculus may develop in a diverticulum and facilitate its recognition. The authors list the following conditions which are to be considered in the differential diagnosis of urethral diverticulum: Gartner's duct cyst, bladder diverticulum, ectopic ureter, abscess of Skene's glands, endometriosis, gonorrhœal urethritis and tuberculosis of the urinary tract. Treatment depends essentially on the principle of closure of the orifice of the diverticulum at its entrance into the urethra. The authors detail various methods of treatment of diverticula of the distal third of the urethra and the anterior and posterior portions of the proximal third of the urethra.

Choriocarcinoma of the Uterus.

EMIL NOVAK AND C. S. SEAH (*Am. J. Obst. & Gynec.*, May, 1954) present a study of 74 cases of choriocarcinoma of the uterus from the Mathieu Memorial Chorionepithelioma Registry. All were considered histologically and clinically to be proven cases of choriocarcinoma. In age distribution 41 of the patients affected were in the group twenty to thirty years and 18 in the thirty-one to forty years group. Twenty-nine cases followed hydatidiform mole, 28 followed abortion, and 17 followed full-term pregnancy. The standard of microscopic diagnosis of the tumour was the presence of large fields of trophoblastic cells with varying proportions between the syncytial and Langhans elements throughout the uterine wall, with no villous pattern, and with adjoining areas of necrosis and hæmorrhage. The authors state that the extent of the primary lesion in the uterus is not an index of the clinical stage of the disease, as the primary lesion may be small, or may have undergone complete regression in a patient with extensive metastases. Eighty-five patients incorrectly diagnosed as suffering from choriocarcinoma were sent to the Registry, the three most commonly incorrectly diagnosed lesions being benign hydatidiform mole (46 cases), syncytial endometritis (19) and *chorioadenoma destruens* (15). In proven cases, the diagnosis was made from curettings in 13 cases, after hysterectomy in 32 cases, from biopsy of metastases in six cases, and at autopsy in 14 cases. The authors state that the common route of dissemination is unquestionably by way of the bloodstream, and after complete removal of the pelvic organs there seems to be no rationale for post-operative irradiation of the pelvic field, as the patient is more likely to die of metastases to some distant organ such as the lungs or the brain. In seven cases there was complete disappearance of the original uterine choriocarcinoma, but death occurred from extensive metastases. No explanation suggests itself other than the assumption that there must be both a local and a systemic defence mechanism against the invasiveness of both benign and malignant trophoblast. There is general agreement that radical removal of the uterus, tubes and ovaries is the wisest plan of treatment if the biological tests indicate the presence of choriocarcinoma. Of the 74 patients 13 are living without recurrence after one year or more (an adequate follow-up period for a disease which usually kills within six months); three additional patients are surviving after six months. Of the 50 fatal cases, in two only did the patient live more than one year—one survived for fourteen months and the other, in whom the primary lesion had disappeared, for three years and one month.

Ovarian Tumours Complicating Pregnancy.

G. W. GUSTAFSON, S. H. GARDINER AND F. STOUT (*Am. J. Obst. & Gynec.*, June, 1954) have collected and analysed 45 cases of surgically proved ovarian tumours, six centimetres or more in diameter, complicating pregnancy. These cases came from four hospitals during the past ten years, representing the findings in well over 100,000 pregnancies. The incidence varied in the different hospitals from one in 1000 to one in 8000. Among the tumours studied were 18 dermoids, 11 serous cystadenomata, four *corpus luteum* cysts and three pseudomucinous cystadenomata. Rare tumours were one Krukenberg tumour and one adenocarcinoma. Of these tumours complicating pregnancy 36% were misdiagnosed. A common pitfall in diagnosis during the first trimester was ectopic pregnancy. During the second and third trimesters a diagnosis of acute appendicitis, abdominal pregnancy and uterine fibroid had been incorrectly made. The pre-operative diagnosis was incorrect in all four cases

discovered during the third trimester. Four patients had ovarian tumours obstructing labour, and two patients with unsuspected ovarian tumours developed acute abdominal symptoms during the puerperium. Symptomless ovarian tumours were found in the course of Cæsarean section for other indications in three patients. The authors consider that X-ray examination of the abdomen is indicated when the presence of an ovarian tumour is suspected during pregnancy. All nine patients submitted to operation during the first trimester presented the clinical picture of an acute abdominal condition. In the second trimester 12 patients had operation on account of progressive lower abdominal pain in the presence of a tender adnexal tumour. Of eight patients who had operation in the third trimester, all were at or near term. Two had signs and symptoms of an acute abdominal lesion, and two had tumours which were considered to offer obstruction of the birth canal. The results of surgical treatment of the 45 patients were as follows: no maternal deaths, no significant maternal morbidity, and a gross fœtal mortality rate of 18%. The authors consider that there appeared to be no correlation between the outcome of pregnancy and the type of anæsthesia or surgical technique employed. They conclude that an ovarian tumour of diameter larger than six centimetres diagnosed in the first trimester should be removed early in the second trimester unless complications supervene. The diagnosis of ovarian tumour complicating pregnancy in the third trimester is increasingly difficult. The diagnosis of an ovarian tumour eight centimetres or more in diameter, at term, warrants Cæsarean section and removal of the tumour. Ovarian tumours obstructing the birth canal are preferably treated by Cæsarean section and removal of the tumour. Four of the five ovarian tumours obstructing the birth canal in the series reviewed were dermoid cysts.

Booster Œstrogen Therapy in Infertility.

W. C. WEIR, W. McK. JEFFERIES, G. T. KENT AND D. R. WEIR (*Am. J. Obst. & Gynec.*, March, 1954) discuss endocrine therapy in relation to infertility problems and present a method of œstrogen therapy in the early part of the menstrual cycle to produce more normal ovulation at the normal time in the cycle. They state that it is known that urinary œstrogen excretion reaches a peak on about the tenth day, then drops, and rises again on the twenty-first day. The early peak of œstrogen secretion may be an important factor in increased gonadotropin output which influences the maturation of the follicle and ovulation. It may also influence the character of the cervical mucus to permit more ready penetration by the sperm and preparation of the endometrium to receive the ovum. The occurrence of ovulation is usually demonstrated indirectly by the biphasic basal body temperature, the presence of a secretory endometrium on biopsy and changes in exfoliated cells of the vagina. Small doses of œstrogens on three successive days resulted in the immediate increase of cornified vaginal cells characteristic of the pre-ovulatory phase of the menstrual cycle. The authors employed booster œstrogen therapy in the following conditions: irregular or delayed ovulation, poor ovulatory responses as indicated by the biphasic temperature curve, persistently negative results from the Simms-Huhner test and infertility with no abnormalities noted. They state that obvious difficulties in this type of therapy are that large doses of œstrogens suppress ovulation, and individuals respond differently to œstrogens. Treatment was usually given for three to four days, ending with the largest dose on the tenth or eleventh day of the cycle. Of the 85 women on whom this therapy was employed, 47% showed apparent improvement in one or more cycles. Booster œstrogen therapy was probably directly responsible for 6% of the pregnancies which occurred in the first 300 couples studied in the clinic. The authors consider that results have been sufficiently favourable to warrant further study.

Tubal Pregnancies.

E. CRAWFORD AND H. HUTCHINSON (*Am. J. Obst. & Gynec.*, March, 1954) have reviewed the literature on tubal pregnancy over the decade 1943-1952 and compare the results with 300 consecutive cases of tubal pregnancy in their practice over the same time period. They draw attention to the wide variation in reported results and state that this variation probably accounts for much of the difficulty in diagnosing ectopic pregnancy. They quote the following results from the literature and from their own study without attempting to explain variations. The incidence of tubal pregnancy is variously quoted at from 0·3% to 0·95% of all pregnancies. More than nine out of ten ectopic pregnancies occur in women between twenty and forty years of age. Two-thirds of patients treated surgically for tubal pregnancies have had one, two or three previous pregnancies. High parity does not exclude a diagnosis of ectopic pregnancy. Some 10% to 30% of patients with an ectopic gestation have been subjected to a previous lower abdominal operation. Of the authors' patients 4% had a tubal pregnancy for the second time. Among symptoms and signs, pain was outstanding and occurred in 94% to 100% of cases; abnormal vaginal bleeding has been reported in 42% to 85% of cases; the incidence of amenorrhœa is reported at figures varying from 50% to 90%. Findings on physical examination are reported in the literature as follows: abdominal tenderness present in 80% to 100% of cases, abdominal mass present in 3% to 12%, rebound tenderness elicited in 25% to 44%, abdominal distension noted in 26% to 40%, a palpable pelvic mass present in 36% to 75% and tenderness on moving the cervix noted by different authors in 32% to 80%. The great variations in results of laboratory investigations used as diagnostic aids for ectopic pregnancy have prompted the authors to resort to fewer diagnostic laboratory procedures. They list the following observations at operation: hæmoperitoneum is present in 88% to 90% of cases, the right tube is more frequently involved than the left tube (53% to 63% of cases), the ampullary segment of the tube is the site of the ectopic pregnancy in 60% to 90% of reported cases, and an interstitial pregnancy is quoted in the literature at figures varying from 1% to 6%. Evidence of salpingitis associated with tubal pregnancy ranges from 20% to 50% incidence in different reports. The consensus of opinion as regard surgical treatment of tubal pregnancy is that surgery should be limited to the primary condition, and that any additional elective surgery is rarely warranted or wise. Cul-de-sac aspiration as a diagnostic aid is considered by some authors as "the most consistently positive diagnostic test". The authors performed cul-de-sac aspiration in 59% of their cases and consider it a valuable diagnostic aid which does not increase the morbidity in ectopic pregnancy. It is widely considered that little or no information of diagnostic value is to be expected from microscopic examination of the uterine scrapings. The general mortality rate from tubal gestation is placed at from 1% to 3%. The authors had no deaths in the 300 cases reported.

Spinal Anæsthesia in Obstetrics.

B. H. WATSON (*West. J. Surg.*, May, 1954) reports 8000 deliveries under spinal anæsthesia at St. John's Hospital from 1943 to 1953. He states that when this method of anæsthesia became more frequently used in 1946 it became necessary to have a trained anæsthetist always on duty. Such an anæsthetist must first be an obstetrician and then an anæsthesiologist. Since 1947, approximately 40% to 50% of the obstetrical anæsthesia has been spinal block anæsthesia. There were seven maternal deaths in the total of 24,000 deliveries. Spinal anæsthesia was used in only one of these cases, and death was not considered to be due to the anæsthetic. The author lists the following contraindications to spinal anæsthesia in obstetrical practice: hypotension, obesity, spinal deformity, skin infection, known pathological conditions of the spinal cord and psychological fear of spinal puncture. Obstetrical contraindications include frank hæmorrhage, anticipated bleeding and anticipated intrauterine manipulation. Breech delivery is not considered a contraindication to spinal anæsthesia. The author prefers to give the spinal anæsthetic late in labour as a terminal type of anæsthesia. In primiparæ it is administered when the cervix is fully dilated, and in multiparous women the anæsthetic is given when the os is seven to eight centimetres dilated, and the head well down in the pelvis. The premedication and technique of the spinal block are described; 0·5 millilitre of procaine (50 milligrammes) is diluted and mixed in the syringe with 0·3 to 0·4 millilitre of spinal fluid. After the patient has been postured to stabilize the anæsthetic agent, she is placed in the lithotomy position for delivery. The author mentions certain advantages and disadvantages of lower level fourth to fifth segment sacral anæsthesia. The advantages of spinal anæsthesia are a conscious patient, a reduced incidence of fœtal depression and anoxia, no risk of inhalation of vomitus, and increased pelvic floor relaxation permitting easier manipulation when necessary. It is stated that the third stage of labour is shortened and the risks of post-partum hæmorrhage are reduced. There have been many disadvantages of spinal anæsthesia stressed in the literature, but the author has encountered only spinal headaches (12%) and aseptic or chemical meningitis (two cases), thought to be due to contamination of needles or syringe by sterilizing solutions. The author believes that spinal anæsthesia is a safe form of anæsthesia for obstetrical cases if carefully and intelligently induced.

Medical Societies.

AUSTRALIAN SOCIETY OF ANÆSTHETISTS.

THE annual general meeting of the Australian Society of Anæsthetists was held on April 26 to 29, 1954, at Perth, Western Australia.

Presidential Address.

DR. MARY BURNELL (Adelaide), the retiring President, gave her address on the subject of "The Future of Anæsthesia in Australia" (see page 653).

The Use of Relaxant Drugs.

DR. J. F. MCCULLOCH (Sydney) read a paper entitled "Some Further Aspects of the Use of Relaxant Drugs" (see page 654).

DR. D. R. C. WILSON (Perth) said that he was against mixing relaxants with thiopentone solution. He quoted an instance in which one-third of a gramme of "Cyclonal" by itself produced complete apnœa. A weak nitrous oxide and oxygen mixture for ventilation purposes followed. A herniorraphy was performed, and the patient gave no indication of further respiration for one and a half hours; had a relaxant been used, it would have been blamed for the occurrence.

DR. K. C. GODFREY (Perth) quoted a case of prolonged apnœa of four hours' duration, which had followed a single dose of thiopentone, *plus* curare.

DR. MARGARET MCCLELLAND (Melbourne) quoted a collection by Dr. A. L. Bridges Webb of 13 cases in which the patient had wakened in the middle of the operation.

DR. MARIE HILL (Sydney) said that prolonged unconsciousness could be produced in babies when ether was employed initially, but subsequently discontinued, while hyperventilation was continued.

DR. L. T. SHEA (Sydney) gave an account of a patient subjected to a thoracic procedure who quoted the conversation which had been carried on during his operation, but did not complain of having felt any pain. Dr. Shea said that if one mixed drugs in a syringe, one should not concern oneself with what was said in the literature accompanying such drugs, but employ the mixture entirely in accordance with the clinical response of the patient.

DR. H. COHEN (Perth) asked whether anyone had awakened under a drip administration of "Scoline".

Dr. Wilson said that a patient who had seemed to awaken was put into retrograde amnesia by an immediate dose of "Cyclonal", and had no subsequent recollection of what had happened.

DR. J. F. BARKER (Adelaide) said that babies who had been hyperventilated might relapse into apnœa very readily, and that it was possible to intubate their trachea with hyperventilation, oxygen alone being used.

DR. MARY BURNELL (Adelaide) quoted the practice of an English anæsthetist, who virtually courted the waking up of patients undergoing mitral valvotomy by inflating their lungs with oxygen only at a critical stage; he considered it a small price to pay as against possible oxygen deficit at that particular stage.

DR. S. V. MARSHALL (Sydney) said that people had wakened up because an element of the balance of anæsthesia had been left out; so-called "minimal" anæsthesia should be condemned.

Dr. Shea said further that the effector response of a baby tended to be inadequate and so might be hard to recognize.

Dr. Marie Hill quoted the belief of Dr. Lucas that babies aged under two weeks had no pain perception which mattered.

Electroencephalographic Studies of the Curarized Patient.

DR. L. T. SHEA (Sydney) presented a paper by DR. G. M. DAVIDSON, DR. J. DAVIS and himself entitled "Electroencephalographic Studies of the Curarized Patient" (see page 656).

DR. H. COHEN (Perth) asked whether any electroencephalographic change could be detected when peripheral stimulation was carried out under thiopentone anæsthesia.

Dr. Shea said that, if the patient was truly anæsthetized with thiopentone, the answer was "no".

Dr. Mary Burnell said that Dr. Shea's paper belied the statement that no worthwhile research was being done in Australia at present.

DR. A. HOCKING (Perth) expressed disagreement with the use of anæsthesia so light that the patient was tossing about on the table at the end of it. He asked whether Dr. Shea tested hearing with the electroencephalograph connected to the patient, and whether an electroencephalographic tracing had been taken after the exhibition of "Tubarine" only.

DR. R. B. SPEIRS (Sydney) thought that there was a tendency to lose sight of the value of following Gray's concept of an anæsthetic as consisting of hypnosis, analgesia and relaxation. Troubles would be encountered if attempts were not made to account for all three of those components. Failure to provide analgesia, for example, would lead to undue dosage of relaxant, and he quoted a recent instance in which a dosage of 160 milligrammes of gallamine, followed at the conclusion of a herniorraphy by an inadequate dose of 0·5 milligramme of neostigmine, then led up to an apparently well-recovered patient being found ten minutes later almost black and exhibiting all the signs of curarization. With regard to the criticism of nitrous oxide which had been voiced, it could fairly be assumed that any patient receiving a mixture of three litres of nitrous oxide to one litre of oxygen would be at least asleep throughout the operation, after the first few minutes had elapsed; a 3% ether mixture could similarly be depended upon to keep a patient asleep.

Dr. Shea said that if a patient was asleep, the rhythm could be disturbed by the stimulus of a frightening noise. He was not convinced of the virtue of nitrous oxide, in that dental patients receiving, say, 20% oxygen and 80% nitrous oxide often tended to move out into the waiting room after a quarter of an hour or so.

Dr. McCulloch said that he also was not convinced of the virtue of nitrous oxide.

A Simplified Closed System Using Only Intravenous Anæsthesia with Relaxants.

DR. D. R. C. WILSON (Perth) read a paper entitled "A Simplified Closed System, Using Only Intravenous Anæsthesia with Relaxants, and a Preliminary Report on Dosage Results" (see page 659).

DR. H. ELLIS (Adelaide) asked what should be the position of the arm in thyroidectomy cases.

Dr. Wilson said that he kept it at the side of the patient with a length of polythene tubing running from the vein to the syringe.

Dr. Cohen thought that nitrous oxide should be considered to be an anæsthetic agent, particularly if it was employed with a flow rate of six litres to two of oxygen.

Dr. Shea said that the position of nitrous oxide could be clarified by consideration of some curves constructed on the basis of dosage and time. They would show that nitrous oxide exerted an influence in the frail subject, but that one would be likely to need such agents as morphine or ether to influence the curves in the case of robust patients. He said that Dr. Wilson's simplified apparatus could be simplified still further to consist of no more than a Waters canister and a syringe, containing a thiopentone and decamethonium mixture.

Dr. Wilson said that he deliberately incorporated air in his technique so that the nitrogen would combat atelectasis.

Dr. Speirs said nitrous oxide had been held to operate with success as a hypnotic, and would work as an analgesic much more often if it was properly given.

DR. A. WALL (Adelaide) asked why nitrous oxide so clearly operated successfully in obstetrics, in which the patients were robust, and in fact were having considerable pain.

Dr. Shea said that there seemed no doubt that some analgesic action was to be anticipated from nitrous oxide.

Dr. McCulloch supported Dr. Shea's view, and further commented on the great reduction in the average dosage of thiopentone which had taken place over the past ten years.

The Effect on Physiology of Active Ventilation.

DR. A. HOCKING (Perth) read a paper entitled "The Effect on Physiology of Active Ventilation". This paper is not available for publication.

Dr. Speirs, in discussing Dr. Hocking's paper, questioned the common advocacy of synchronization of the respiratory assistance with the patient's natural respiratory movement. He said that if the collapse and filling of such a vein as the external jugular vein were watched, it could be readily shown

that this process resulted in the sudden reversal of a negative intrathoracic pressure and suction of venous blood into the thorax, to a positive intrathoracic pressure and presumed arrest of the flow of blood into the thorax from the veins; it might be better to abolish the spontaneous respiration entirely if one proposed to ventilate the patient's lungs actively.

Dr. Mary Burnell pointed out that common ventilation by the anæsthetist had been practised long before the advent of curare.

Dr. Cohen said that a rate of respiration greater than 14 per minute had been shown to be bad for the circulation.

Dr. Ellis asked whether any tests of venous pressure had been taken in respect of emphysematous patients.

Dr. Shea quoted Mushin to the effect that certain sick people did better if allowed to breathe for themselves. He said that it was very difficult even to hold a bag without creating a sustained positive pressure within it.

Dr. McCulloch said that it was probably better to abolish respiration altogether than to attempt to assist it, particularly in the case of chest operations. He referred to Nosworthy's classical article on thoracic anæsthesia, published in the *Proceedings of the Royal Society of Medicine* in June, 1941. Dr. McCulloch thought that emphysema presented great problems, and that it was often better to use ether or cyclopropane on such patients, and keep relaxants to a minimum.

Anæsthesia in Pædiatric Practice.

A combined meeting was held with the honorary medical staff of the Princess Margaret Hospital for Children, at the hospital.

DR. MARGARET MCCLELLAND (Melbourne) read a paper entitled "Anæsthesia in Pædiatric Practice" (see page 662).

Dr. Wilson agreed with Dr. McClelland on the importance of the psychological aspects of hospitalizing children. He said that forcible induction of anæsthesia in a screaming child should be a thing of the past. He advocated the letting in of the peripheral section of a child's Magill tube at an angle more suited to entering the larynx. Minimal anæsthesia with adequate ventilation should suffice in the case of the new-born. He thought that the period of returning to the ward was one of real danger, and that recovery rooms would be of great help.

Dr. Mary Burnell supported Dr. McClelland's contention that premedication with morphine and hyoscine was satisfactory. She quoted a recent instance in which a four year old child survived premedication with one-quarter of a grain of morphine with one one-hundredth of a grain of hyoscine. She thought that phenobarbital was good for premedication, and considered that ether was not very unpleasant as an anæsthetic agent for a child, and that as a rule not much vomiting followed its use. An aural airway or a pack alongside a tube in the trachea often prevented it from kinking. Breath-holding could be very destructive if ether was used on the very young. Cyclopropane, or nothing, might be preferable.

Dr. Barker supported the idea that a wide-bore endotracheal tube should be used for bronchography. He thought that ether should be considered to be an unpleasant anæsthetic agent for children.

Dr. Cohen asked whether atropine was to be used as well as hyoscine in the premedication.

Dr. Hocking asked Dr. McClelland what type of indwelling needle she used.

Dr. McClelland said that she often employed intermittent puncture without an indwelling needle.

DR. C. FORTUNE (Perth) pointed out that there was difficulty in balancing the relative claims of absence of psychological trauma by anæsthetizing the patient in the ward, as against the danger inherent in doing this away from resuscitation facilities, and so on.

DR. GWENIFER BERNARD (Sydney) advocated giving a child something to do—for example, "take big breaths along with the anæsthetist".

DR. WINIFRED WALL (Adelaide) advocated having the mother present, and perhaps anæsthetizing the child in her lap. She thought the dangers of tonsillectomy were great when the anæsthetic was given in the dark by a junior anæsthetist.

Dr. McCulloch thought that most children would accept thiopentone, and he agreed with Dr. McClelland that the hazard of the occasional full stomach was very great.

Current Anæsthetic Practices.

DR. S. V. MARSHALL (Sydney) read a paper entitled "Current Anæsthetic Practices" (see page 667).

Dr. Hocking asked whether the average surgeon considered an ether anæsthetic unsuitable as coming from a specialist.

Dr. Ellis wondered whether there was anything against mixing a thiopentone solution with saline in lieu of water.

DR. W. A. PRIOR (Melbourne) asked how dangerous was ethyl chloride.

Dr. Marshall replied that he thought it should be used with care and discrimination.

Dr. Mary Burnell quoted an experience of Dr. Cole with ethyl chloride in cylinders employed on a gas machine. Dr. Cole had apparently concluded that respiration was principally affected, rather than the circulation.

Dr. Barker quoted a case of infection in an arm, which was subsequently shown to be part of an agranulocytic condition in the patient.

Dr. Marie Hill asked how a surgeon who wanted both ether and the diathermy should be dealt with. The reply was that the idea should be to make the surgeon responsible.

Dr. Prior quoted an instance in which a combination of such therapies had been watched by the anæsthetist through the operating theatre window.

Dr. Shea quoted experiments which had been carried out during the war to show that 5% thiopentone solution was highly antiseptic. He said further that the teaching of principles should be hammered in, as they did not change; that was of more importance than teaching resident medical officers the refinements of technique. He felt that, in general, a strong line should be taken with the refractory surgeon.

Dr. Speirs inquired what was the truth concerning hepatitis. Notwithstanding the General Medical Council's dictum concerning autoclaving as the only adequate precaution, it was undoubted that autoclaving was quite uncommon in Australian practice of anæsthesia, and it was also undoubted that no train of hepatitis had been produced by anæsthetists so far, although the incidence of that condition from transfusions of serum (one case for every 40 serum transfusions) was the same in New South Wales as overseas.

Dr. Wilson quoted an experience in which an administrator had used a cigarette lighter to observe the progress of an ether anæsthetic being given in the dark.

Dr. Piercey asked how safe chloroform was.

Dr. Marshall thought its use should be confined to obstetrics only.

Dr. Gwenifer Bernard said that she confessed to the use of eight inches of corrugated rubber tubing between the mask and the canister, and she thought that with the practice of hyperventilation, carbon dioxide accumulation was avoided.

Dr. Marshall replied that it was wonderful what the human frame would stand.

Dr. Wilson said that the yokes on the machine should be made non-interchangeable.

Dr. Margaret McClelland quoted a recent instance in which a death had occurred in Melbourne from the coupling of a wrong cylinder to a machine. She said that the Commonwealth Industrial Gases organization was setting about making this impossible.

Dr. McCulloch said that it was clear that there was great variation between practice of anæsthesia in different States, and even between different hospitals in the same State. However, he thought that it was very stupid to combine diathermy with an ether administration merely on the basis that explosions were rare.

Anæsthesia for Bronchography in Childhood.

DR. MARY BURNELL (Adelaide) read a paper entitled "Anæsthesia for Bronchography in Childhood". She said that a technique first seen at the Hospital for Sick Children, Great Ormond Street, London, had been followed at the Adelaide Children's Hospital for over a year, and found to be more satisfactory than other methods. Preparation of the patient was important for good results, the aim being to have the lung free of secretions. The patient was admitted to hospital a week beforehand for breathing exercises, postural drainage and antibiotic therapy with penicillin and chloramphenicol. Premedication with a short-acting barbiturate and atropine was used. The drugs used were thiopentone (0·05 gramme) and gallamine triethiodide ("Flaxedil")—10 milligrammes for each 10 pounds of body weight, given slowly as a single

intravenous injection. The lungs were inflated with oxygen; bronchoscopy with suction was performed, and then a large plain oral Magill's tube was passed into the trachea and connected to a Cobb's piece with the stopper removed. A brisk stream of oxygen was run into the side arm of the Cobb's piece. Intermittent occlusion of the open end of the Cobb's piece would inflate the lungs when desired. The examination was not continued until slight respiratory efforts commenced, sufficient to keep the patient a good colour during the subsequent instillation of opaque material through a small gum-elastic catheter, and "positioning". The lungs might be positively inflated when opportunity offered. When the procedure was completed, the dye was aspirated from the air passages with a Triemann's catheter, which could be passed at will into either bronchus. The cough reflex returned rapidly, and the endotracheal tube was then withdrawn.

Dr. Burnell said that the technique had the following advantages: (i) elimination of risk of explosion; (ii) light anæsthesia and quick recovery; (iii) shorter anæsthetic time; (iv) preference for the method by the small patients, usually unpleasantly experienced in general anæsthetics.

Dr. Cohen suggested the use of thiopentone and "Scoline", repeated as required.

Dr. Hocking thought that the use of a relaxant led to greater alveolar filling, as did active ventilation.

Dr. Burnell, in reply, said that she doubted that that was so.

Dr. Barker considered that the wide-bore Magill tube gave good control for oxygenation and suction in dealing with sick patients. He thought that slight respiration should be allowed to begin before the "Lipiodol" was run in.

Dr. Margaret McClelland suggested the use of "Avertin", followed by ether; she thought that these patients should be handled by senior people.

Dr. Burnell, in reply, said that she would have recourse to ether only if there was no available vein, however young the patient might be.

Dr. Marie Hill quoted circumstances in which the patient was transported down three flights of stairs to the X-ray department; she thought that that seemed to preclude the use of relaxants.

Dr. Shea asked about the sequence of thiopentone and "Scoline", followed by maintenance of anæsthesia with pethidine and "Scoline" mixed, the patients being adults.

Dr. Wilson said that there was a local impression that relaxants did lead to more alveolar filling.

Dr. McCulloch emphasized that there should be adequate preparation—for example, over a period of a week.

Epidural Block for Analgesia and Induced Hypertension.

DR. RUSSELL COLE (Melbourne) presented a paper entitled "Epidural Block for Analgesia and Induced Hypertension" (see page 669). The paper was read on his behalf by DR. G. V. PERN (Ballarat).

Dr. Marshall said that he had had practical experience of the technique described some seventeen years earlier. The paper constituted a very thorough account of that procedure, and the author should be congratulated. The idea was not new and had been tried in a number of countries. The new drug "Xylocaine" would overcome many previous difficulties. With a high block the diaphragm had been known to turn inside out. "Spinal headache" was not necessarily abolished.

Dr. Mary Burnell said that a practical demonstration by Dr. Cole in Melbourne had been very impressive.

Dr. Hocking considered that the non-return of cerebrospinal fluid was not a certain indication that total spinal anæsthesia would not result. He did not understand why adrenaline was excluded from the solution used; 800 milligrammes of "Xylocaine" as used seemed a large dose, and he had seen a death from 650 milligrammes of "Xylocaine" without adrenaline. The results with the technique tended to be unpredictable. Considerable anatomical variation in the area concerned had been shown by Bryce Smith. The blocking of sympathetic nerves to the fifth thoracic segment would produce a pronounced fall of blood pressure, and magnificent results had accrued from employing sympathetic block in cases of eclampsia.

Dr. McCulloch said that the "Xylocaine" dosage seemed very high for use without adrenaline. The neurological sequels following spinal anæsthetics were very final.

Overheating of the Anæsthetized Patient.

DR. MARY BURNELL (Adelaide) read a paper entitled "Overheating of the Anæsthetized Patient" (see page 673).

Dr. Wilson said that the over-administration of atropine to children should be carefully avoided.

Dr. Barker said that long operations might well be avoided when the external temperature was high.

Dr. Winifred Wall said that overheating was of great importance with neuro-surgical cases, in particular when the posterior cranial fossa was involved, and the use of atropine might have to be avoided in such cases.

Brachial Paralysis After Anæsthesia with Thiopentone, "Flaxedil" and Nitrous Oxide.

DR. WINIFRED WALL (Adelaide) read a paper entitled "Unilateral Brachial Paralysis after Anæsthesia with Thiopentone, 'Flaxedil' and Nitrous Oxide" (see page 674).

Dr. Marshall asked what were the ages of the patients, as such an occurrence had been known to be due to osteoarthritis around the nerve foramina.

Dr. Wilson said that he used the left arm if the patient was right-handed, and vice versa; there was then less incapacity should any damage occur in the arm. He thought that if the arm was left outstretched it should be tied to a stand to relieve the stretching.

DR. L. G. B. CUMPSTON (Perth) said that an abducted arm should be pronated rather than supinated. He asked whether the use of pelvic supports was of any value.

Dr. Prior and Dr. Shea both mentioned the use of corrugated rubber mattresses on which the patient's skin would not slip; the question of a pre-fixed or post-fixed brachial plexus was also brought up. Dr. Shea further quoted some X-ray films which had been shown to a New South Wales meeting, to indicate that no anatomical changes could be detected in the shoulder girdle, despite the use of relaxants during anæsthesia.

DR. K. C. GODFREY (Perth) said that the arm might slip off a small pillow and sag, so that trouble was caused.

Dr. McCulloch advocated the use of one shoulder prop only, should this be possible.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

PAINLESS SURGERY.[1]

[From the *Australian Medical Journal*, August 2, 1847.]

THE undersigned has much pleasure in announcing to the Faculty of New South Wales that he is manufacturing the APPARATUS for the inhalation of the Vapour of ETHER which has met with the approbation of the first medical men in the Mother Country and is pronounced by the London Press to be unequalled from the many advantages it possesses over all others—amongst which are:

1st. The air taken into the lungs is exclusively that which has passed through the vessel of Ether.

2nd. The pad or cup held over the mouth is so formed and the Elastic Tube so flexible as to be adapted to the various contours of the patient and prevents the breathing of the free atmosphere.

3rd. The expired air from the lungs escapes with the most perfect freedom without re-entering the Ether Vase.

4th. It has a stopcock to regulate the Volume of Ether and to cut off the supply at the "proper moment".

5th. It is constructed so securely that there is no possibility of escape so that the apparatus may at all times be kept ready for use without waste of any portion of Ether.

ARTHUR GRAVELY,
Furnishing and General Ironmonger,
Brazier and Tin Plate Worker &c.,
280 Pitt St., Sydney.

[1] From the original in the Mitchell Library, Sydney.

Post-Graduate Work.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Balmoral Clinical Meeting.

THE Post-Graduate Committee in Medicine in the University of Sydney announces that a clinical meeting will be held at the Balmoral Naval Hospital on Tuesday, November 9, 1954, at 2 p.m., when Dr. Bruce Hall will speak on "Diarrhœal Disorders in Service Personnel". Clinical cases will be shown after the lecture. All members of the medical profession are invited to attend.

Part II Diploma Courses for D.A., D.G.O., D.L.O. and D.O.

Pathology lectures for the Part II courses for the D.A., D.G.O., D.L.O. and D.O. will begin on Monday, November 29, 1954. After a recess from December 22, lectures will be resumed on January 10, 1955, and continue until mid-March. Fees for attendance will be £31 10s. for each course. Candidates wishing to enrol are asked to communicate immediately with the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney.

Course in Advanced Medicine.

The Post-Graduate Committee in Medicine in the University of Sydney announces that a course in advanced medicine suitable for candidates for the examination for membership of The Royal Australasian College of Physicians will be held for a period of ten weeks, beginning January 10, 1955, and terminating on March 19, 1955. Fee for attendance will be £31 10s. The programme has been arranged to take place in the afternoons from Monday to Friday and on Saturday mornings.

It is desirable that candidates should have had considerable experience in clinical work either in hospital or in medical practice before considering themselves prepared to take examinations for higher medical degrees or diplomas. The course will also be found of value to practitioners intending to devote further time to acquiring such experience before taking the examination and to those not seeking higher qualifications but who are anxious to widen their knowledge of internal medicine. The scope of the course includes the following: special instruction in electrocardiography; ward rounds and demonstrations of cases at the principal metropolitan hospitals; regular clinico-pathological conferences; lecture demonstrations in pathology, hæmatology and biochemistry; demonstrations of the application of radiological methods of diagnosis to medical diseases; tutorials in case-taking; demonstrations and lectures in psychiatry; demonstrations of neurological cases and electroencephalography.

The supervisor of the course will conduct tutorials on selected subjects and will be available to discuss with students any problems arising in the course. It is expected that students will devote considerable time to reading of text-books and current medical literature.

Fees are payable in advance at enrolment date, and early application is desirable. Applications to attend the whole or part of the course should be addressed to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney. Telephones: BU 5238, BW 7483.

The Royal Australasian College of Physicians.

MEETING OF VICTORIAN FELLOWS AND MEMBERS.

A MEETING of Victorian Fellows and Members of The Royal Australasian College of Physicians will be held at Prince Henry's Hospital, Melbourne, on November 20 and 21, 1954. The programme is as follows:

Saturday, November 20: 11.30 a.m., "The Use of 'Banthine' and Allied Substances", Dr. R. R. Andrew; 12 noon, "Ulcerative Colitis", Dr. G. A. Penington; 1.30 p.m., "Morbidity after Gastrectomy", Dr. I. J. Wood; 2 p.m., "Gastroscopy: Indications and Contraindications", Dr. W. E. King; 2.30 p.m., "Pitfalls in Radiology of the Upper Alimentary Tract", Dr. P. Davis; 3.30 p.m., "Hæmatemesis and Melæna", Dr. P. J. Parsons, Dr. I. Cuming.

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED SEPTEMBER 25, 1954.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	4(2)	1(1)	..	..	..	..	..	..	5
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	..	..	..	..	..	..	..
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	1(1)	..	..	..	..	..	..	1
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	..	..	..	1	..	..	..	1
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	2(2)	16(13)	10(10)	..	..	..	..	8	36
Diphtheria	5(3)	4(1)	1(1)	..	..	..	..	..	10
Dysentery (Bacillary)	..	..	8(8)	3(3)	..	..	..	1	12
Encephalitis	2(1)	1	..	..	..	..	..	..	3
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	1	..	..	..	..	..	..	1
Infective Hepatitis	47(14)	42(28)	..	..	5(5)	..	1	5	100
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	7	..	..	..	..	..	7
Malaria	..	1(1)	..	..	2(2)	..	..	..	3
Meningococcal Infection	4(2)	5(2)	2	..	..	..	..	..	11
Ophthalmia	..	..	..	..	..	..	..	..	..
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	5(3)	8(6)	3(2)	6(4)	1(1)	..	..	1	24
Puerperal Fever	2	..	1(1)	..	..	..	..	..	3
Rubella	..	29(11)	1	..	22(20)	..	..	..	52
Salmonella Infection	..	..	..	..	..	..	..	..	..
Scarlet Fever	9(7)	19(12)	14(12)	4(3)	2(2)	..	..	..	48
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	..	..	1	..	..	..	1
Trachoma	..	..	..	..	3(1)	..	..	..	3
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	35(27)	34(28)	23(16)	5(3)	7(4)	7(1)	1	..	112
Typhoid Fever	1(1)	..	..	..	..	..	..	..	1
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	..	..	..	..	..
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.

Sunday, November 21: 10.30 a.m., "Hepatic Coma", Dr. W. Crane; 11 a.m., "Surgery of the Œsophagus", Dr. Russell Howard; 11.30, "Œsophageal Pain", Dr. Luke Murphy.

All members of the British Medical Association are invited to attend.

Royal Australasian College of Surgeons.

PRIMARY EXAMINATION FOR THE F.R.A.C.S.

A PRIMARY EXAMINATION in anatomy (including normal histology) and applied physiology and the principles of pathology will be conducted in Melbourne in March, 1955. The written papers will begin on Thursday, March 10, 1955. The examination is reciprocal with the primary examination for Fellowship of the Royal College of Surgeons of England, the Royal College of Surgeons of Edinburgh, the Royal College of Surgeons in Ireland and the Royal Faculty of Physicians and Surgeons of Glasgow. Each candidate will be notified by post of the result at the termination of the examination.

The examination is open to graduates of not less than one year's standing of a medical school approved by the Council of the College for the purpose. Candidates must submit evidence of their qualification and of the date of acquirement thereof. Forms of application for admission to the examination may be obtained from the Secretary, Royal Australasian College of Surgeons, Spring Street, Melbourne. The fee for admission, or readmission, to the examination is £15 15s. Australian currency (*plus* exchange on cheques drawn on banks outside Melbourne). The fee must be forwarded with the form of application so as to reach the Secretary at his office not later than January 27, 1955.

Notice.

LONDON MEDICAL EXHIBITION, 1954.

THE London Medical Exhibition will take place this year from November 15 to 19 inclusive at the Royal Horticultural Hall, Westminster, London, S.W.1. The exhibition covers over 120 of the foremost manufacturers in Britain of ethical medical preparations, surgical instruments, medical equipment, hospital equipment *et cetera*, and demonstrates the latest developments in medical and hospital practice. Performances of the latest films of medical interest take place daily. A comprehensive catalogue is issued free of charge, and the new issue of the "London Medical Handbook" is available to visitors. Official invitation tickets may be obtained by medical men and hospital officers on application to the organisers, The British and Colonial Druggist, Limited, 194-200 Bishopsgate, London, E.C.2.

Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Atkinson, Leicester Albert, M.R.C.S. (England), 1940, L.R.C.P. (London), 1940, Saint Vincent's Hospital, Sydney.

Hissink, Louis Anne Gerhard, provisionally registered in accordance with the provisions of Section 17 (1) (*d*) of the *Medical Practitioners Act*, 1938-1953, 197 Ocean Street, Narrabeen.

Medical Appointments.

DR. J. H. MICKAN has been appointed honorary medical officer at the Port Augusta Hospital, South Australia.

Deaths.

THE following deaths have been announced:

HECKER.—Stewart Roy Hecker, on September 28, 1954, at Adelaide.

DEVLIN.—Henry William Devlin, on October 7, 1954, at Sydney.

CUMPSTON.—John Howard Lidgett Cumpston, on October 9, at Canberra.

SKYPE.—Joseph Michael Skype, on October 12, 1954, at Sydney.

MCEWEN.—Ronald James Brohan McEwen, on October 13, 1954, at Sydney.

Diary for the Month.

OCT. 27.—Victorian Branch, B.M.A.: Branch Council Meeting.
OCT. 30.—New South Wales Branch, B.M.A.: Branch Meeting.
NOV. 2.—New South Wales Branch, B.M.A.: Organization and Science Committee.
NOV. 3.—Western Australian Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Norseman Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Tasmania: Part-time specialist appointments for the north-west coast of Tasmania.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

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